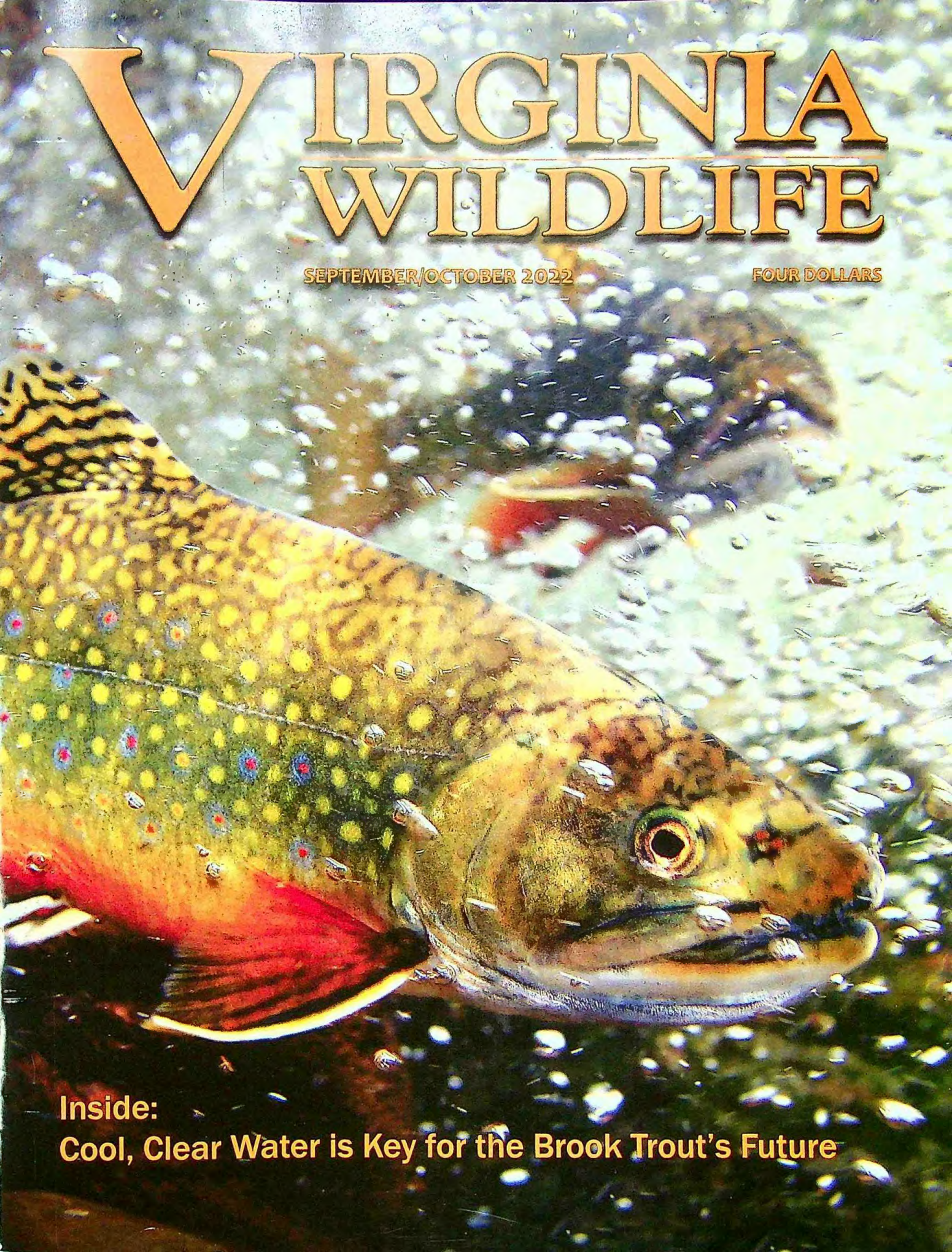
VIRGINIA WILDLIFE

SEPTEMBER/OCTOBER 2022 FOUR DOLLARS



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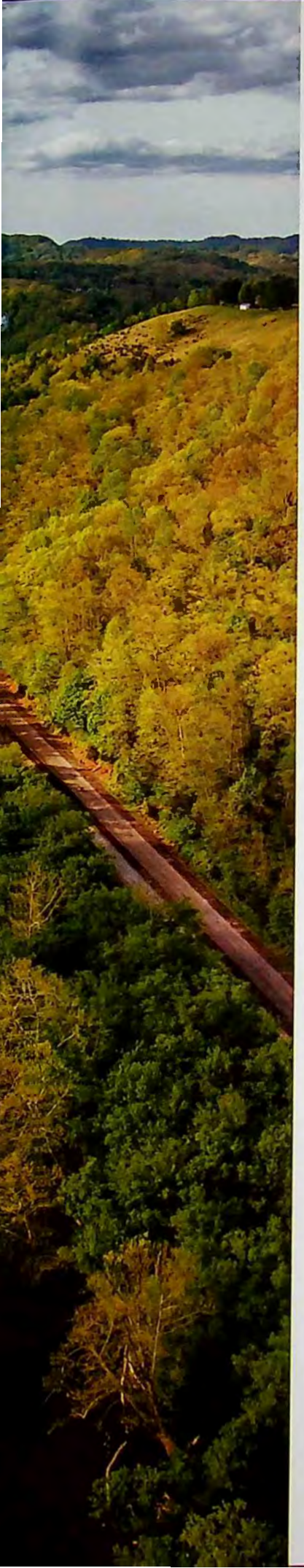

VIRGINIA WILDLIFE

SEPTEMBER/OCTOBER 2022
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RYAN J. BROWN
Executive Director

Wildlife and fisheries conservation is an extraordinary mix of science and art accomplished with a fascinating combination of ever-evolving technology and good, old-fashioned common sense and hard work. In this issue, you can learn about environmental DNA, or eDNA, one of the cutting-edge tools biologists with the Department of Wildlife Resources (DWR) can employ to collect data about fish and aquatic wildlife populations in "Environmental DNA is an Exciting New Tool for Biologists" on p. 12. But you can also read in "Cool, Clear Water is Key for the Brook Trout's Future" on p. 6 about how the simple act of planting trees on the banks of rivers and streams can have a dramatically positive effect on brook trout and other fish populations.

Animals and fish can't talk, so the biggest puzzle of wildlife conservation is deciphering what challenges a species is facing, how those challenges affect the species and others, and what those species need to thrive as a population. Wildlife and aquatics biologists spend much of their time collecting data and information about existing populations to try and solve those puzzles. The tools they use continue to evolve, especially in the aquatics realm, where the wildlife is hidden from view under water and constantly moving. Far from the old days of visually counting fish, fisheries biologists now can utilize strategies from electro-shocking fish to sampling environmental DNA to determine the population ranges of certain species.

Data collection is just the first step of piecing together the puzzle; biologists then need to evaluate and analyze the information to see what it tells them about the species or waterbody they're studying. It's not an instant-gratification process by any means. DWR fisheries biologists have just concluded 10 years of data collection monitoring water temperatures and other environmental factors in a wide variety of streams and rivers. Now they have to organize all those data points and figure out what they mean for those fisheries and fish populations. There are no quick, easy answers in wildlife conservation. And wildlife and fisheries biologists work in both highly sophisticated computer programs and simple hands-on field work.

The vast majority of wildlife conservation work comes down to habitat, or the places where animals and fish live, eat, and reproduce. Wildlife needs safe, healthy habitat to thrive, and there can be a multitude of threats—man-made and natural—to that habitat. As you can read about in "Marsh Magic" (p. 28), an unassuming plant can fill an absolutely essential role in an animal's environment, and that plant depends on very specific soil, water, and weather conditions to grow. Small disruptions can have outsized effects on habitats with a ripple effect. For all that technology has facilitated and expanded the information-gathering side of the process, the actual boots-on-the-ground work of restoring and maintaining habitat is predominantly low-tech and accomplished with tools such as shovels and bare hands. For brook trout habitat restoration, planting vegetation on stream banks, moving rocks in the water to create pools, and removing barriers are simple yet extremely effective strategies.

The world moves fast, and it's easy to forget that wildlife and fish often have trouble adapting to some of the changes. When biologists work to help, they employ a unique combination of high-tech and low-tech tools and skills, but the end goal is always to make the outdoors safe and healthy for wildlife and fish and the people who enjoy them.

CONSERVE. CONNECT. PROTECT

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Conserve and manage wildlife populations and habitat for the benefit of present and future generations. Connect people to Virginia's outdoors through boating, education, fishing, hunting, trapping, wildlife viewing, and other wildlife-related activities. Protect people and property by promoting safe outdoor experiences and managing human-wildlife conflicts.

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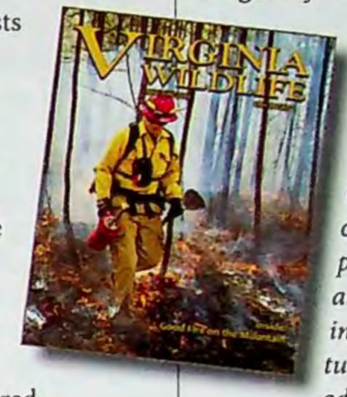
Knowing Lennie

We wanted you to know how very much we enjoyed your article ["Leonard Lee Rue III Captures Wildlife Like No Other" in the May/June issue]. Dad is 94 and knew Lennie, and I went to school with his younger son James for a few years. We lived in Blairstown, New Jersey, where dad was raised from 1928. Dad especially loved the mention of Camp Pahaquarry Boy Scout camp; he went there every summer! Lennie came to our school for an assembly every year, a slide show included. Thanks for the great article.

Fred Buehler, Jr., and JoAnn Pierce, Christiansburg

About Prescribed Fire...

Thank you for this interesting article with excellent photos, ["Good Fire on the Mountain" in the May/June issue]. The value of "controlled burns" is clear. However, the cited article was not clear on the time of year/season when such burns are optimal. My fellow hunters and conservationists are concerned that such burns may be undertaken during the spring when turkey hens, especially, are nesting on the forest floor. And, regardless of the time of year for such controlled burns, the article was not clear whether other forest-floor creatures such as salamanders (featured in previous *Virginia Wildlife* articles) and wood tortoises may be killed since they would be hard-put to escape even low-intensity burns.



William Crisp, Staunton

William, we have an article on the Good Fire *page on DWR's website that addresses this very question:* virginiawildlife.gov/blog/timing-a-prescribed-fire/. *As you'll read in that article, there are many factors that go into deciding the timing of a prescribed fire, including weather, safety, the goal of the burn in terms of effect on the vegetation, and more. In general, the cost/benefit analysis in terms of the immediate impact of a fire versus the long-term habitat improvement for wildlife of multiple species makes prescribed fire an effective and beneficial tool for wildlife in the long term. In terms of turkey nesting, which is also addressed in that article, please also read the National Wild Turkey Federation's statement on prescribed fire:* nwtf.org/conservation/article/prescribed-fire-letter.

- Molly Kirk, editor

Rowdy River Companions

[This photograph is] of Jeff Sullivan and I fishing the Rappahannock in the late afternoon.

The striped bass and shad that we caught are not in this picture; however, I thought someone may appreciate our fascination with the sport of fly fishing in any type of weather and with any waterfowl companionship. Blue herons, geese, eagles, osprey, and cormorants, and Jeff and I approach claiming our respectful positions and proceed to collectively fish this rowdy river for the same satisfaction.

To me, it is a communion of the highest order.

Diane Gulick, Warrenton

We want to hear from you! We welcome letters to the editor, questions for our staff, photos you capture of wildlife, and experiences you want to share. Please include your name and address when you send correspondence to editor@dwr.virginia.gov via email or by mail to Editor, Virginia Wildlife, P.O. Box 90778, Henrico, VA 23228-0778. Correspondence chosen for publication may be edited for clarity and/or length.

Connect with Us!

Cool, Clear Water is Key for the Brook Trout's Future

While Virginia's charismatic state fish is facing some challenges, efforts are underway to help it thrive.

By Molly Kirk

With its vivid coloring and status as the only native trout to Virginia and the state fish of Virginia, the brook trout (*Salvelinus fontinalis*) is an iconic fish for the Commonwealth's anglers. Brook trout have occupied Virginia's high-elevation, cold-water streams since the glaciers receded in the last Ice Age more than 15,000 years ago. For many anglers, catching a wild brook trout from one of Virginia's picturesque streams is an experience difficult to match.

But the brook trout's very name reflects its vulnerability. "Fontinalis" means "of the springs," revealing the species' reliance on cool, clear water to survive. Brook trout prefer water temperatures below 65°F. "Temperatures of about 70 degrees are going to be stressful or fatal to a brook trout, while they'd be ideal for a largemouth or smallmouth bass," said Department of Wildlife Resources (DWR) Chief of Fisheries Dr. Michael Bednarski. They also require well-oxygenated water of exceptional quality, a habitat of sand and gravel stream bottoms with minimal sedimentation, and waters shaded by vegetation and woody debris.

Unfortunately, trends of warming waters and increasingly intense precipitation events that result in dramatic water flows, erosion, and sedimentation threaten brook trout populations in Virginia.

"We have a variety of concerns about what's going to impact brook trout," said Bednarksi. "In addition to stream temperatures warming, there are also concerns about habitat conditions and degradation and a variety of other factors. It can be death by a thousand cuts. The difference between stress and lethal is a fine line. The fish can handle stressful temperatures at some level, but if you have other factors being put into place, it compounds and you can see sub-lethal effects even if the water isn't at lethal levels of warmth."

Brook trout occupy more than 614 individual streams over 2,000 miles of water in Virginia. In the Virginia Wild Trout Management Plan (2019-2028), DWR biologists note that DWR "has documented declines in occupied habitat on several streams and recognizes threats that may cause additional population declines. Therefore, the brook trout was listed as a Species of Greatest Conservation Need in the 2015 Virginia Wildlife Action Plan." The Wildlife Action Plan identifies opportunities to maintain and improve natural habitats and conserve wildlife in response to 21st century challenges.

A 2013 study, "Virginia's Climate Vulnerability Assessment" by Austin Kane of the National Wildlife Federation (NWF); Chris Burkett of the DWR; Scott Klopfer of the Conservation Management Institute; and Jacob Sewall, PhD, of Kutztown University, included one model that predicted the extirpation of brook trout from Virginia by the end of the 21st century. "Both the lower and higher emissions scenarios indicate Virginia could become climatically unsuitable for brook trout by mid-century. This could result in the possible extirpation of this fish and other cold water species," stated NWF's study.

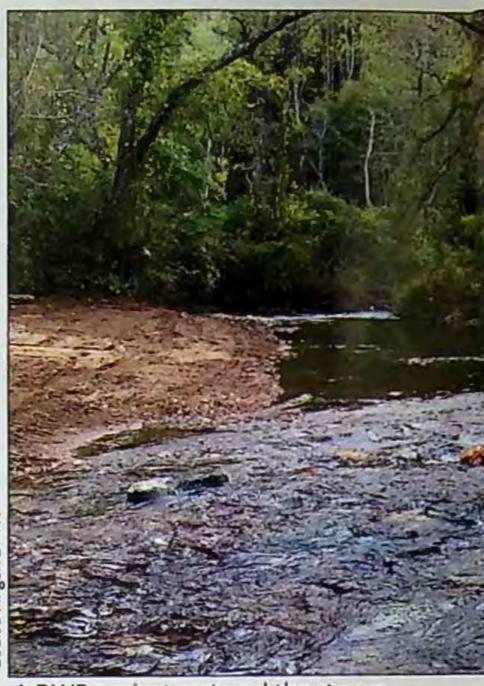
NWF's study has a dramatic conclusion, but other scientists have conducted studies that resulted in different models and predictions. The bottom line is that there's no crystal ball for knowing how Virginia's brook trout populations might react or adapt to changing conditions. With that in mind, DWR fisheries staff is working with various other state and federal agencies and non-governmental organizations to understand the challenges that brook trout face and implement strategies to mitigate them.

"We really believe that the best strategies involve habitat restoration—stream shading, maintaining stream integrity, restoring fish passage—to help reduce the impact of increased

Brook trout: ©Patrick Clayton/Eric Engbretson Underwater Photography, Backgrounds: Shutterstock

Louise Finger/DWR

Crooked Creek runs through DWR's Crooked Creek Wildlife Management Area with more than 2 miles of native brook trout waters. This portion of the creek shows severe bank erosion.



Louise Finger/DWR

A DWR project restored the streambank of this section of Crooked Creek, stabilizing the bank to prevent further erosion and enhance aquatic habitat.

thermal stress on those water bodies," said Bednarski. "If we help keep them cooler, it will help to maintain brook trout populations."

Knowledge is Power

In 2011, DWR biologists installed temperature-sensing data loggers in more than 50 wild trout streams from different physiographic regions, latitudes, elevations, and with different amounts of groundwater inputs, collecting hourly water temperature measurements.

The U.S. Forest Service, National Park Service, United States Geological Survey, and Trout Unlimited are also collecting water temperature data from select wild trout streams in the George Washington and Jefferson National Forests, Shenandoah National Park, and private lands.

Analysis of DWR's data has begun. "We have 10 years of data to see if anything's changed," said Brad Fink, a DWR coldwater fisheries biologist. "We wanted to get a 10-year period before we analyze because you want to know the long-term trends."

DWR also works with various partners to gather and share information about what's going on in Virginia's brook trout streams, including the Eastern Brook Trout Joint Venture (EBTJV), a network of experts who coordinate and fund regional brook trout research and habitat improvement projects.

"We work with a number of different groups, including the EBTJV," said Fink. "There's also the Southern Division of American Fisheries Society trout committee and a Chesapeake Bay Program Brook Trout Action Team. We all share knowledge and data, what we're working on, and sometimes we work jointly on projects across the region."

Established in 2005 to improve fishable populations of wild brook trout, one of EBTJV's most important products has been its assessment of brook trout from Georgia to Maine. "We work with states and federal agencies to know where brook trout are, from actual data from electroshocking or by using landscape variables to predict where brook trout would be," said Lori Maloney, coordinator at EBTJV. "We are currently working on an update, so we can track losses and gains, and areas to protect."

This distribution map can be used interactively with other habitat information to help the EBTJV and wildlife agencies make management decisions and use resources where they'll have the most impact. "We look for patches or strongholds, or connected brook trout populations," Maloney said. "One thing we are working to do is to layer this information with temperature data, so we can ask, 'Here's a stronghold of brook trout that we want to protect, what's going on with stream temperatures there?' Or we can identify streams with cool groundwater flow that will really help the brook trout hold on.

Louise Finger/DWR

The DWR project stabilized the bank to prevent further erosion and enhanced aquatic habitat.

We're looking to see how we can use that information to better manage the future for brook trout by helping direct federal and state dollars to projects that put brook trout back in streams, or remove barriers, or further improve stream habitat."

To determine where brook trout are swimming in Virginia, DWR fisheries staff uses electrofishing, a method of shocking fish with a low-voltage current of electricity in a specific stretch of stream, then capturing the temporarily stunned fish. Once they're weighed and measured and the data recorded, the fish are released unharmed. Recently, DWR biologists have added another tool—environmental DNA, or eDNA (for more about eDNA, see "Environmental DNA is an Exciting New Tool for Biologists" on page 12).

"When we electrofish, we only do 100 or 200 meters of stream. We may not get everything. Whereas the eDNA picks up for a whole kilometer," said Fink. "It's one of those tools that we're probably going to start rolling into our sampling protocol." Both electrofishing and eDNA will help DWR biologists determine which waters host brook trout, helping guide management decisions.

Riparian Remedies

It's not just the temperature of the water that's so important to brook trout; it's also the quality of the water and the composition of the streambed. According to DWR's Wild Trout Management Plan, "Wild trout require 'pea-sized' gravel substrate free of fine sediments to reproduce. Sediment can also reduce habitat complexity vital for different life stages of wild trout. In addition, sedimentation can also negatively affect stream macroinvertebrate populations, which are a valuable food source for wild trout."

Severe storms and heavy rain events, which are increasing in frequency, cause both the erosion of streambanks, sending a cascade of sedimentation into the water, and increased velocity of stream flows, which can disrupt fish spawning or displace eggs. Protection and restoration projects of stream and river banks (also known as riparian areas) can help reduce sedimentation in wild trout streams.

Riparian restoration and protection includes projects such as erosion and sediment control plans and permits, streambank protection projects, exclusion of livestock from riparian areas, tree planting in riparian zones, construction of raingardens, and stormwater retention structures, according to the Wild Trout Management Plan. There are multiple nongovernment organizations in Virginia working to help restore and maintain trout habitat, such as Trout Unlimited and the Piedmont Environmental Council.

DWR has also established Time of Year Restrictions (TOYR) for work conducted in or near wild trout streams to reduce sediment input to the stream when trout are engaged

©Bruce Ingram

Livestock with access to streams can affect water quality by increasing sedimentation, disrupting the stream bed, and harming vegetation on the banks.

Fish passage projects that replace barriers with fish-friendly solutions like this culvert expand the range of a variety of fish.

in spawning activity or eggs and sac fry are present. The U.S. Army Corps of Engineers and Virginia Department of Transportation follow TOYR guidelines when working in or near wild trout waters.

Trees in riparian areas don't just prevent erosion and sedimentation, they also provide essential shade to help keep the water cool, create cover and pools, and add leaf litter. "If the trees are there, insects are going to follow, and that's food for brook trout," said Maloney.

One tree species in particular that is important to trout streams in the region is the Eastern hemlock (*Tsuga canadensis*). The hemlock's needles form a dense canopy that helps shade a stream or river even more than a hardwood tree. But an invasive insect, the woolly adelgid (*Adelges tsugae*) from East Asia, has been killing off hemlocks in the Mid-Atlantic region.

The woolly adeligid harms hemlock trees specifically, but poor land use practices—like agriculture and growth of development, or a history of clear-cutting—are much more common drivers of tree loss in riparian areas and resultant habitat losses for brook trout. Restoring that riparian vegetation can help expand brook trout habitat and range.

Maloney points to a project along Massanutten Mountain that EBTJV helped the U.S. Forest Service (USFS) and other partners with on Smith Creek. In just 12 years, an intensely farmed stretch of the creek that had barren riparian areas was converted to an area with dense tree canopy and stabilized banks, resulting in much healthier habitat for brook trout and other species.

Make Way for Trout

Another strategy employed to help brook trout populations is fish passage projects. According to the Wild Trout Management Plan, "Wild trout require unimpeded mobility up and downstream and access to tributaries for spawning, locating low-flow and thermal refugia, and for maintaining genetic viability." Things like dams, poorly-designed box and pipe culverts, and low-water hardened fords can obstruct the movement of brook trout.

DWR biologists, including Fink, recently received training from the U.S. Fish and Wildlife Service (USFWS) to better assess fish passage at culverts and identify locations where passage can be improved. DWR works with organizations such as the North Atlantic Aquatic Connectivity Collaboration (NAACC), a network of organizations and agencies, to learn more about improving aquatic connectivity.

Fish passage is another area where organizations like EBTJV, Trout Unlimited, and the Piedmont Environmental Council work to provide guidance and funding for projects. Many trout streams are located on or border private properties, and the organizations assist landowners in replacing driveway or

NCTC Image Library

©Max Meneveau

Brook trout are a treasured resource for Virginia's anglers as well as an integral part of the aquatic ecosystems, so preserving their habitat to keep them healthy into the future is important.

road culverts with solutions more amenable to fish passage.

"When you replace a culvert with a crossing that is sized appropriately to let water through without damaging the stream or roadway, you're actually helping improve brook trout's ability to find cooler water and suitable habitat, for not only foraging and living, but also for spawning and reproducing," said Maloney. "It also helps with climate resilience for the connected human communities because the replaced crossings are much easier to maintain and much safer because they are much less likely to wash out during large storm events."

Once fish habitat has been restored, putting brook trout back into streams by relocating wild brook trout from other water bodies can help boost the populations. In 2017, DWR worked with Trout Unlimited and USFS to relocate 150 wild brook trout into Upper Passage Creek on the George Washington National Forest. DWR biologists are monitoring that population to see if natural reproduction occurs for multiple years. There are seven other streams where DWR has helped reintroduce or introduce wild brook trout and seen them establish native, reproducing populations.

What You Can Do

Everyone wants to see brook trout not only thrive as a native species, but also continue to be a prized sport fish for Virginia anglers. For anglers, fishing can be done with an effort to minimize the stress on brook trout. "Generally, we don't see too much fishing pressure on brook trout in those streams in terms of catch-and-keep mortality, so we don't see a need to put regulations in place," said Bednarski. "If anglers want to go a step beyond, they could avoid fishing for brook trout during the summer or during the hottest hours of the day."

The primary way citizens and anglers can help Virginia's brook trout population is to get involved in efforts to improve habitat. If you've got property along a stream, keep the riparian zone in good condition so that there's shade on the water. Make sure the banks are intact to prevent sediment spreading. If your property includes a barrier to fish passage, work with the state agency to identify funding sources to help you remove or replace it with a solution that allows fish to move beyond it.

"It will have benefits to you and the people who live around you as well as to brook trout," said Maloney. "The entire aquatic community benefits from all the measures that improve habitat for brook trout, as it also improves water quality for people who live downstream."

Molly Kirk is the DWR Creative Content Manager

Environmental DNA is an Exciting New Tool for Biologists

Analysis of DNA found in water can help track species and assist in their conservation.

Story and Photos by Evan Visconti

Shutterstock

On a spring morning in rural Charles City County, a team of fish biologists met at Walker's Dam on the Chickahominy River to conduct weekly river herring and shad surveys. They looked a bit like anglers preparing a high-tech fishing pole as they readied their equipment on the downstream end of the dam's fishway.

Timothy Owen, Department of Wildlife Resources (DWR) assistant fish passage biologist, maneuvered a long retractable pole over the low-head dam so that an attached hose dipped just below the surface of the water. With a nearly silent whirr, a highly precise pump sucked water through a small filter at the end of the pole. The filter was then sent to the National Oceanic and Atmospheric Administration's (NOAA) Northeast Fisheries Science Center to be tested for the presence of river herring and shad DNA.

Walker's Dam is one of many sites where eDNA testing is done to monitor shad and herring migration and spawning seasons.

"Over 100,000 river herring and shad pass through the Walker's Dam fishway each spring to make their way to native spawning grounds upriver," said Owen. They travel in large bursts to spawn and then quickly return to the sea. With traditional survey methods such as electrofishing downstream and upstream of the dam they can be easy to miss simply due to bad timing.

DNA, or deoxyribonucleic acid, is the hereditary material in organisms that contains the biological instructions for building and maintaining them. Each species, population, and even individual, has a unique pattern of DNA. Environmental DNA, or eDNA, is made up of all the microscopic cells that are left behind from an organism as it goes about its daily life, such as feces, mucous, and shed hair or skin. In water, eDNA only lasts between seven and 21 days, depending on environmental conditions. By collecting those cells and amplifying them in a laboratory, scientists are able to detect what species of fish have been in a body of water after they've already passed through the area.

"We don't have a robust set of data that tells us how far river herring migrate upstream during spawning season," explained Lisa Moss, fish biologist for the U.S. Fish and Wildlife Service (USFWS). "We want to know which historical creeks they are currently using so that we can pinpoint passageways to improve."

Small Fish with a Big Impact

River herring and shad are historically valued in tidewater Virginia, where they have served as a source of sustenance for Indigenous tribes and local communities for centuries. In 2012, Virginia declared a ban on river herring fisheries in all coastal rivers of the Chesapeake Bay, Meherrin River, Nottoway River, Blackwater River (Chowan Drainage), North Landing, and Northwest rivers and their tributaries plus Back Bay, due to severely depleted stocks throughout the coast.

"From the [USFWS] standpoint, river herring are considered an at-risk species," said Moss. "At one time they were in such abundance in this area. They represent a group of species that have been negatively impacted by modern life."

River herring such as alewife and blueback herring are key to supporting the larger marine food web during the majority of their lives spent in the ocean, and their spring spawning runs have historically supported ecosystems and communities more than 100 miles inland, according to the National Fish and Wildlife Foundation.

The river herring and shad spring spawning runs were a vital resource to the Chickahominy Tribe who have called the lands of the James River watershed home since long before colonial explorers first arrived to Virginia in the early 1600s.

"Throughout history these fish have been harvested by our tribe for sustenance," said Dana Adkins, the Chickahominy Tribe's environmental director. "I remember even as a child, the herring and shad runs were really anticipated within my community because they were such an important food source."

Although life on the river has changed for the Chickahominy people who now hold jobs in the everyday workforce, Adkins said fishing is still very important culturally. "It's almost like a glue, so to speak, a tradition that has been observed within my tribe from the time I can first remember. If you lose a tradition that was important to the tribe, you lose a little bit of yourself."

Yet the biggest loss, explained Adkins, would be to the ecology of the river as a whole. "When you lose one species,

Previous page, top left: Timothy Owen (right), DWR assistant fish passage biologist, samples for herring and shad DNA at Walker's Dam with Lisa Moss (left), fish biologist for the USFWS. Left: Gizzard shad is a highly regarded species in the life cycle of the river.

it makes it that much harder to maintain the health of the surrounding ecosystem," he said.

Finding Passage

Throughout the spring of 2022, scientists working on identifying the highest priority fish passage problems for river herring on James River tributaries teamed up to collect eDNA samples weekly during spawning runs at eight locations near and east of Richmond. This partnership includes DWR, the USFWS, the James River Association, and Virginia Commonwealth University (VCU).

Common blockages to fish passageways include dams that tend to be complete barriers for most fishes and road crossing culverts that fish must try to navigate through to get upstream. Since river herring lack the ability to jump over barriers in the water, their populations are especially vulnerable to being cut off from critical spawning habitat.

"We're using eDNA to make sure we aren't missing any sites that are critical to open access for these fish," said Alan Weaver, DWR fish passage coordinator. "We want to improve aquatic connectivity across the watershed."

DWR uses a scoring system designed by the North Atlantic Aquatic Connectivity Collaborative to rate each potential stream barrier with a standardized passability score. According to Weaver, the barriers that score poorly for overall passability and are then confirmed to be a blockage for river herring and shad will be prioritized for improvements.

eDNA is also useful in the longer term because only a small portion of the entire sample is used during testing. "The excess is put into a deep freeze and archived," said Owen. If someone wants to know something about that community at a later time, they can reanalyze the sample.

Data collected over a long period of time is more useful for depicting broader trends associated with changes in biodiversity. Additionally, geneticists could be able to gather even more information from the eDNA samples in the future. "The technology continues to advance, so what we're constrained to now won't be the case in a decade or so," said Owen.

Stopping Spread

The unique ecology of the Chickahominy River and much of tidewater Virginia south of the James River is being threatened by non-native nutria, which are large semi-aquatic rodents. Scientists hope that the same techniques used to track fish with eDNA could also be used to track terrestrial species like nutria that might dip into the water more occasionally.

Nutria have the ability to wipe out entire marshlands by consuming the roots and tubers of the vegetation that holds the marsh together. Native to South America, nutria expanded their range into Virginia in the 1950s after being released in Louisiana and other southern states where they were imported for fur trade.

Stephanie Coster, assistant biology professor at Randolph-Macon College, is helping DWR figure out the best approach to sample for nutria eDNA. Currently, DWR maintains multiple nutria detection platforms baited with attractant that include wires designed to capture some hair. Biologists monitor the platforms regularly for snagged hair identifiable as from a nutria. DWR also has a nutria detection dog that searches areas for nutria scent. (See more about DWR's nutria detection efforts in "Menace of the Marsh" in the November/December 2021 issue of *Virginia Wildlife*.)

"I've been going out monthly to see if water table levels or mating times change our ability to detect nutria," said Coster. "We know they're in this small pond in Suffolk, and that is a really good place to start because if we aren't getting positive eDNA hits, we can figure out what factors may influence our ability to detect them."

Lynda Richardson/DWR

After a water sample is taken, the filter is removed for processing in the lab. Blue silica gel desiccant pellets protect the sample.

Lynda Richardson/DWR

Stephanie Coster, assistant biology professor at Randolph-Macon College, works in her lab to process a sample to determine if it contains nutria DNA.

DWR biologists have not begun any eradication efforts in Virginia for nutria yet, but they are currently developing a new plan for an active eradication effort now that nutria have been detected north of the James River, said Michael Fies, DWR wildlife biologist and furbearer project leader.

"We're not only concerned about their presence in the Chickahominy River because it's a beautiful ecosystem, but also since they crossed the James River, they have an opportunity to continue moving north," said Fies.

"It's about figuring out where they are, getting to those sites quickly, and not allowing it to spread," said Coster. "If you can figure out where the edge is, you can eliminate the spread and that's a good first step. eDNA could be a useful tool in these unknown scenarios."

A Gauntlet of Threats

Fish passage barriers and habitat degradation are just the tip of the iceberg when it comes to the threats that are holding back river herring and shad. "Human development along rivers and streams, water intakes, and predation at various life phases by introduced fish are also impacting these fish," said Owen.

"Each individual threat alone isn't enough to keep them down, but put together they are running a gauntlet of threats," said Weaver. "That's why we don't see river herring and shad at the levels we want. Unfortunately, you can't just make a lot of these threats go away."

During an electrofishing session, Timothy Owen (left), DWR assistant fish passage biologist, and Lisa Moss (right), fish biologist for the USFWS, use nets to scoop up stunned fish.

Human development of all kinds along historic spawning grounds is having an effect on the water quality, salinity, and the underlying structure of streambeds and their natural flow. Water intakes for irrigation, factories, power plants, and drinking water are known threats to fish as well, said Weaver.

"Because you have this list of threats, it makes any given passage project that much more important," said Weaver. "We're trying to piece by piece give the herring the advantage and make it so that anything you can control, you do your best effort to make that difference."

Combining Tools

After surveying at the dam, the team traveled upstream on the Chickahominy River to two additional survey sites. Between collecting eDNA samples, they utilized a more traditional but still widely used survey method called electrofishing.

A specialized boat designed to safely output electric current into the water stunned any fish within the immediate vicinity and caused them to temporarily float motionless. The fish were quickly netted, counted, and measured to give scientists a better understanding of the health, size, and range of their population. The fish were returned to the water unharmed and swam away safely.

The team caught 60 alewife, one of two similar-looking species that make up the river herring family; the other is blueback herring. Any eDNA samples taken in locations downstream of where the fish were caught using electrofishing would act as a form of a control for the research.

This information is valuable to geneticists who are working to perfect the use of eDNA on a continuously growing range of aquatic organisms, while also expanding upon what conclusions can be drawn from the DNA within a given sample.

"Doing side-by-side comparisons of traditional fish methods like electrofishing with eDNA surveys allows us to hone in and really understand the potential for quantitative assessment using eDNA," said Christopher Rees, geneticist at the NOAA Northeast Fisheries Science Center.

Rees uses a process in the laboratory called a quantitative polymerase chain reaction, or qPCR, to amplify the river herring and shad DNA in the samples to provide a positive detection.

"The challenge is that eDNA does not tell you anything about the size of the animal you might be detecting. So it could be a lot of small fish or several large fish that both happen to release the same amount of DNA," said Rees.

For this reason, the laboratory tests conducted at the Northeast Fisheries Science Center will strictly provide a detection or non-detection result for biologists in Virginia tracking fish. Geneticists hope to someday use eDNA as a survey tool for measuring abundance, and the possibility for that in the future seems promising.

"Honestly from my perspective, I would say we've only touched the surface so far," said Rees of eDNA's application in the field.

Evan Visconti is a freelance environmental journalist reporting on conservation and wildlife. He earned his master's degree in journalism from Emerson College and is currently based in Williamsburg, Virginia.

FANTASTIC FUNGI

Mushrooms bring an intriguing pop of color to the woods.

Story and Photos by Byron Meade

What comes to mind when you think about Virginia's biodiversity? Perhaps the stately white-tailed buck or a boisterous wild turkey? You would be forgiven if all that comes to your mind are the usual plants and animals, but what about the more enigmatic and often ephemeral organisms, the fungi?

When you read the word "fungi," the mental image it conjures is probably that of a mushroom, or maybe even the delicious spring delicacy, the morel! The mushroom is in fact, just the "fruiting" body of the organism that produces spores and can be thought of like the apple on the apple tree. The bulk of the fungal organism, called a mycelium, lives in a substrate like soil or wood, growing and feeding until environmental conditions are ideal for spore production. Unlike an apple though, the fruiting body of the mushroom will mature and disappear in a relatively short time, adding to the fungi's mysterious nature.

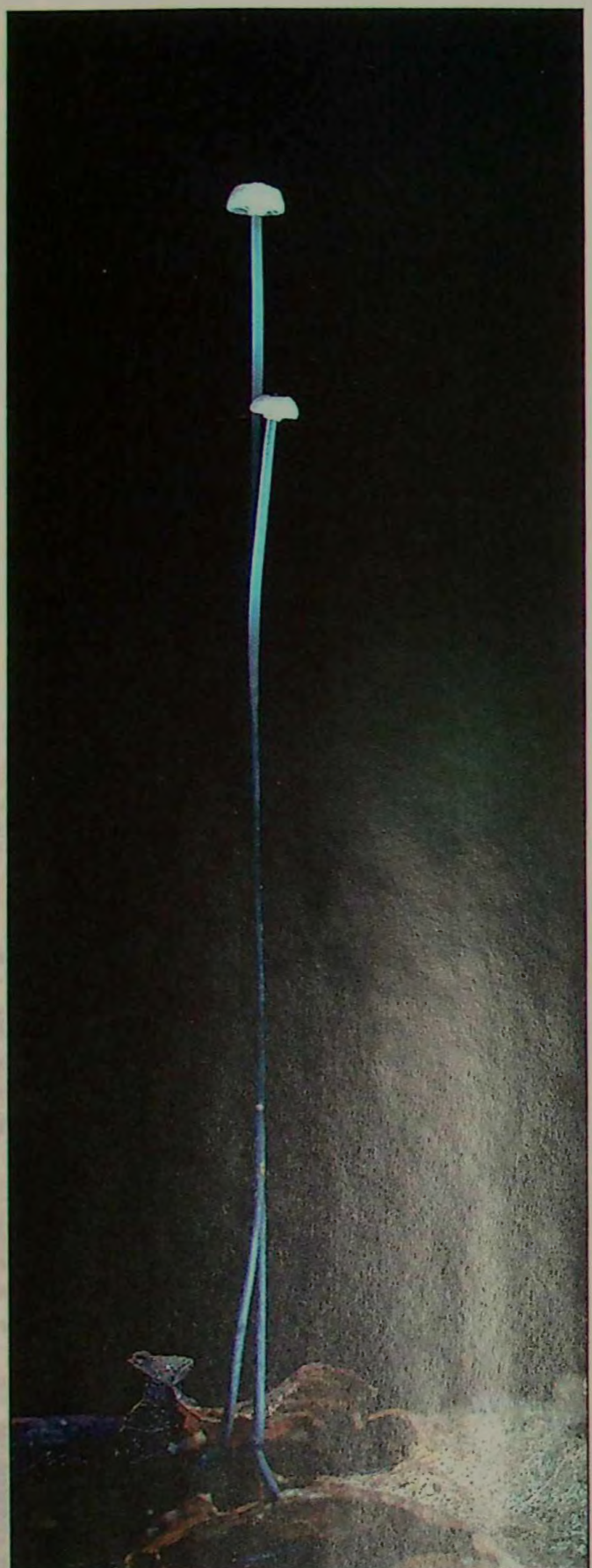
Unlike their autotropic neighbors that can produce their own food using light, water, carbon dioxide, or other chemicals, fungi must consume food from the environment around them. This makes fungi more closely related to animals than to plants. In fact, fungi are so unique and diverse that they constitute their own kingdom of life! Whether they are recycling dead plant matter, facilitating communication between plants, or even attacking living tissue, fungi are everywhere.

The varying ecosystems of Virginia make for a veritable cornucopia of fungal diversity. Throughout the commonwealth, you can find a range of mushrooms in every conceivable color and texture. All the photographs shown here were taken in Breaks Interstate Park in Southwestern Virginia. My personal favorites are the bioluminescent species.

Yes, you read that right, we have glow-in-the-dark mushrooms right here in Virginia! It is the goal of this photo essay to challenge your perception of what a fungus looks like and to showcase some of the brilliant diversity that Virginia's fungi has to offer.

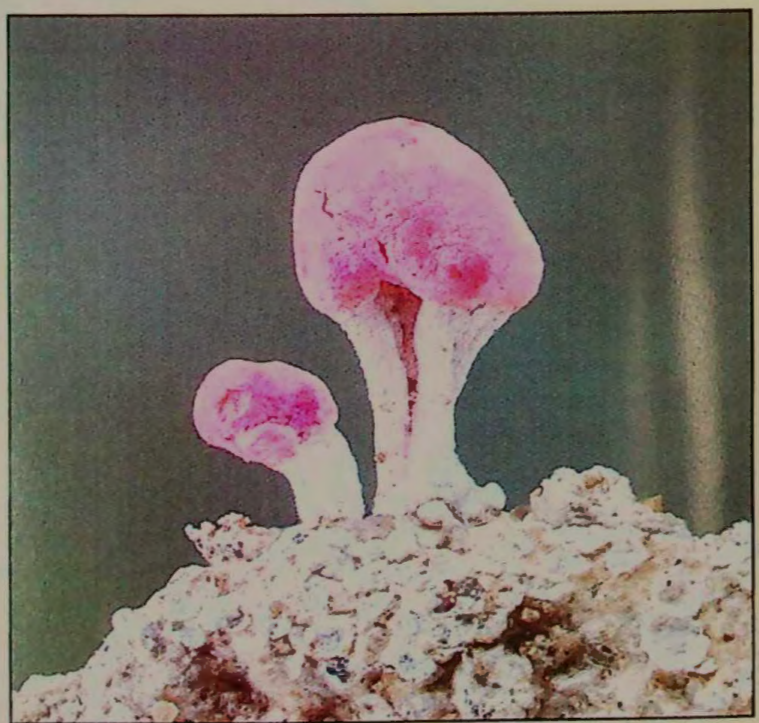
**Editor's note: the species of fungi pictured here are not edible mushrooms. When foraging for edible mushrooms, always confirm identification of species with a field guide or experienced forager.*

Left: Bitter oyster or luminescent panellus, *Panellus stipticus*, one of the bioluminescent fungi whose glow inspired the term "foxfire" coined by early colonists in eastern and southern North America. Above: Lea's mycena, *Mycena leaiana*, can be found clustered on hardwoods.



Marasmius capillaris, a saprobic fungus that grows from fallen leaves of oaks and other hardwoods.

Yellow deer mushroom, *Pluteus chrysophlebius*, grows from rotting wood.



Pink earth lichen, *Dibaeis baeomyces*, a tiny fruticose lichen typically 1 to 4 mm in diameter and 6 mm tall.

Purple jellydisc, *Ascocoryne*, contains an antibiotic compound that inhibits the growth of some gram-positive bacteria.

Indigo milk cap, *Lactarius indigo*, forms symbiotic relationships with the roots of plants. When cut with a knife, it exudes a blue milky substance.

Nectria pseudotrichia, a fungal plant pathogen.

Stalked scarlet cup, *Sarcoscypha occidentalis*, can be found growing on fallen hardwood branches.

Pinwheel or collared parachute mushroom, *Marasmius rotula*, is often overlooked because of its small size, with a cap usually less than 2 cm in diameter.

ROD+REEL REPAIR
3612 N. LEE HWY
703 528 3022

THE SHOP TIME FORGOT

For three decades, Phil Evans of Rod & Reel Repair has been part of the heart of Northern Virginia's angling community.

By Dr. Peter Brookes
Photos by Lynda Richardson/DWR

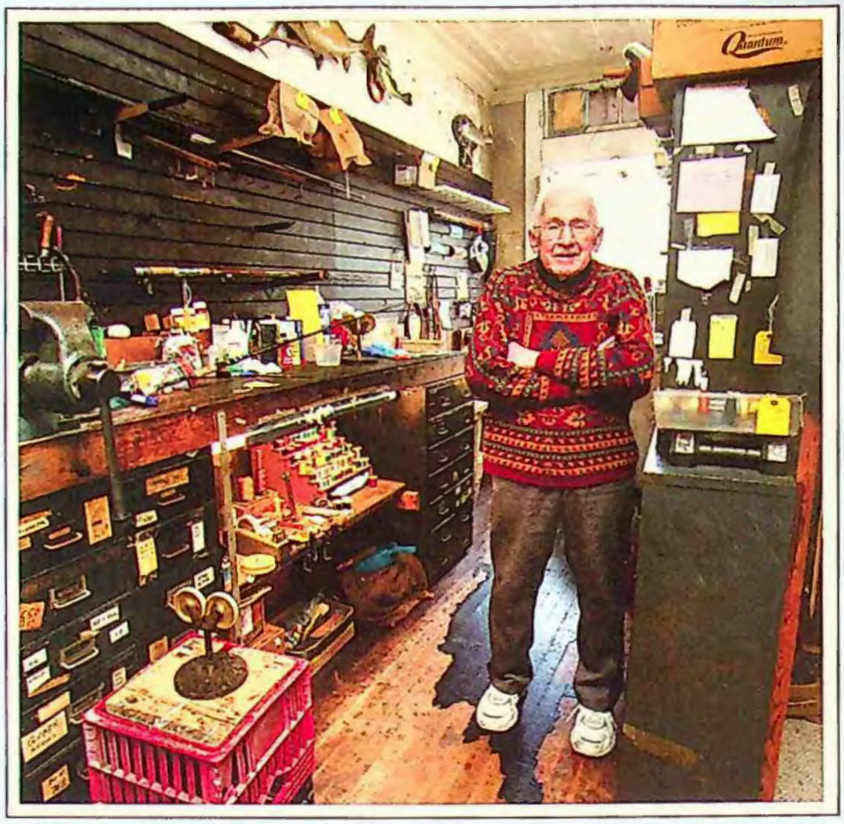
It's not easy to interview an icon. By icon, I mean someone who's a mainstay of a community and has already had articles written about him in the popular, cosmopolitan *Washingtonian* magazine and in the venerable, outdoorsy *Field & Stream*. And that is what describes Phil Evans.

Phil has owned and operated Rod & Reel Repair in Arlington since 1993—and would, due to his service to the fishing community, be considered by many to be Northern Virginia's "go-to" guy for fishing gear repair.

I met Phil on a bright winter Saturday morning before opening hours at his understated, one-room shop on Langston (previously Lee) Boulevard for a quick chat, amongst the unclaimed rods and reels for sale and those waiting for repair.

While a fishing show plays on a TV in the background, Phil tells me he isn't a native Virginian, but instead was born in Scranton, Pennsylvania, in 1934. It turns out that as the work got scarce in the Pennsylvania coal mines Phil's family picked up and left Scranton when his father and mother found

Left: Rod & Reel Repair's original sign still hangs over the shop in Arlington. Above: Phil Evans works on a reel in his shop, unchanged after more than three decades in business.



Left: Phil Evans was featured in the *Washingtonian* magazine in 2004 when he was 69 years old. Right: Phil Evans, wearing the same sweater, strikes the same pose for *Virginia Wildlife* magazine 18 years later.

government work at the Pentagon during World War II.

Phil never finished high school and took a job as an office boy at the *Washington Evening Star* newspaper. He eventually went back to school, got his GED, and studied computer programming and data processing in community college.

After working in that field for a while, Phil started to learn rod and reel repair at a local Herman's Sporting Goods in Washington, D.C. He eventually opened Rod & Reel Repair in the '80s with stops in Washington, D.C., and Mt. Rainier, Maryland. He finally settled into his Arlington location in 1993. He lives above the store and commutes down the stairs each day. But after nearly 40 years in business—and at nearly 88 years young—he wants a well-deserved break from "scrubbing fishing reels." So, as Phil puts it, he's selling out.

Phil has been fishing since he was 12 years old. He smiles when he recalls his many boyhood memories in Arlington, telling me how he and his pals would grab their bikes and head to local fishing holes to chase whatever fish would grab their hooks. You can see a twinkle in Phil's eyes when he tells me that the fishing of his youth in Northern Virginia was "wonderful," hitting places like Roaches Run and Gravelly Point with his buddies for perch, catfish, and carp and D.C.'s tidal basin for carp and black crappie.

Interestingly, Phil says that the largemouth bass fishing is much better today than it was back in his younger days; he also remembers that there were phenomenal herring and striper runs in the Potomac, but that the super popular shad runs of today were pretty sparse.

The youthful anglers kept just about everything they caught—and ate those that were deemed safe. Phil says that even back then there were public health advisories on which fish were okay to consume. He tells me that in those days the Potomac River was really a "polluted mess." Interestingly today, the Potomac's waters are considered clean enough by some that there is a movement to re-open the river to public swimming. Phil quickly credits President Lyndon Johnson and his 1966 Clean Waters Restoration Act for the tremendous progress in the amelioration of the Potomac's water quality—and the subsequent improvement in the fishery.

Though a conventional gear angler at heart, as an adult he also enjoyed fishing for brook trout in Shenandoah National Park with buddies, catching them on the fly. Or as Phil laughingly puts it: "Chasing four-inch fish while getting lost in the woods."

He is heartened by the fact that Virginia has such a wonderful variety of fish and fishing today, commenting how newcomers to the area have added a new vibrancy to the Northern Virginia fishing scene.

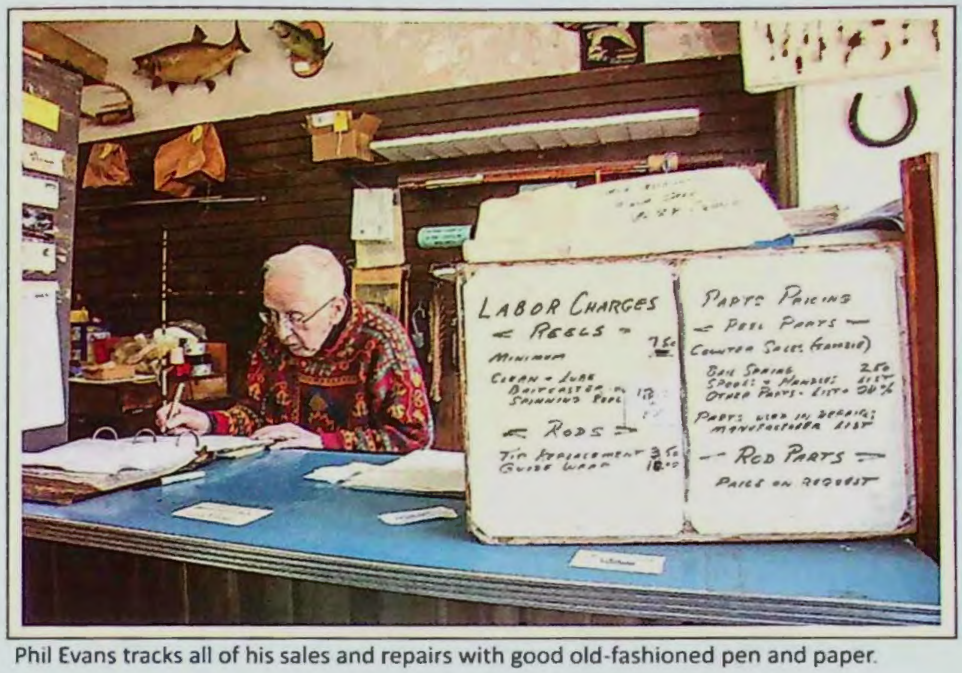
Though he may be ready to end his

nine-to-five routine of many years at the shop, he still has some fishing to do. On his bucket list is fishing for tarpon in Florida, no doubt influenced by the book, *Lords of the Fly: Madness, Obsession, and the Hunt for the World-Record Tarpon*, which he pulls off a shelf and passes on to me to read—and then instructs me to pass on to another angler when I'm done.

I asked him why he hadn't retired earlier? He responded: "Habit," adding, "I worked long, but not that hard."

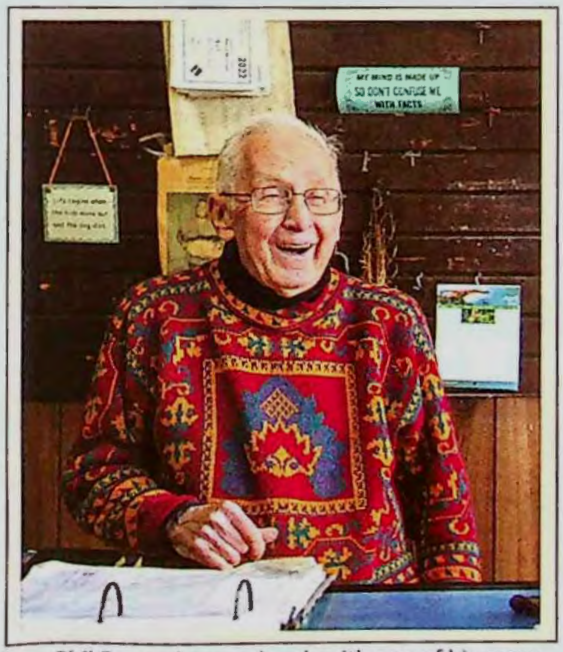
I then asked him how the "big box" sporting goods stores—the bane of many smaller fishing shops—affected his business? He looked at me quizzically, saying that since he does repair, he doesn't see the big box stores as competition and, in fact, receives many referrals from them. With a sense of pride, Phil says that's he one of the few—and maybe the only—shop around the area that does repairs of rods and reels, giving his place a unique niche in the local fishing business scene.

Asked what he would have liked to have done if he hadn't opened this shop, Phil says he has no regrets but would've

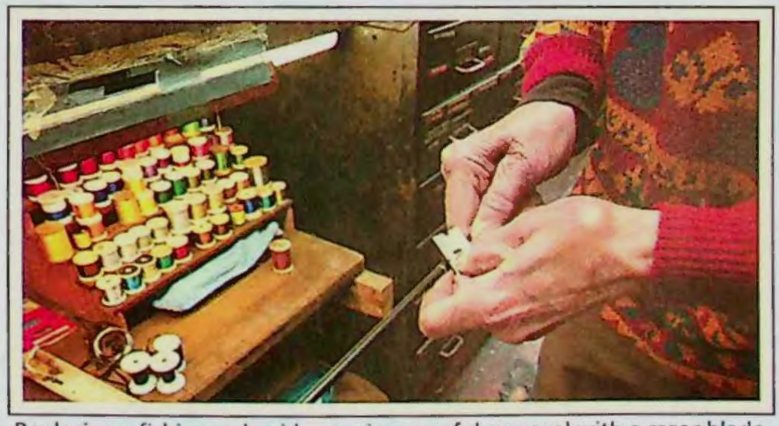


Phil Evans tracks all of his sales and repairs with good old-fashioned pen and paper.

A customer describes the repair he needs to a fishing rod as Phil Evans listens.



Phil Evans shares a laugh with one of his many customers.


Replacing a fishing rod guide requires careful removal with a razor blade.

maybe liked to have been a doctor to help fix up people just like he fixes up rods and reels.

I can see that.

In retirement, he plans to move from his apartment above the shop, get a room near a library, and read a lot of books, sharing with me a list of works handwritten on the back of a piece of scrap cardboard. The weighty list includes the likes of Bertrand Russell, a British mathematician, essayist, and philosopher.

In closing our conversation, I asked Phil what his favorite local place to fish was, thinking he probably has a few of them, coming to the area in 1943. (I, of course, was scheming to get some good "intel" for my own local fishing outings.) As I breathlessly got ready to take down the "lat and long" of the locations of his favorite spots on my notepad, I sensed a pause in the cadence of the conversation. I looked up at Phil, who had a mischievous smile on his face.

He said: "I'm really sorry, Pete, but I can't tell you." As anglers often do, Phil clearly didn't want to "hotspot" any local fishing holes or give away any cherished secrets to this budding outdoor writer and avid angler. I let out a heavy sigh, and smiled back, disappointed with his sudden case of "lock-jaw"—that condition every angler dreads when the fish just don't seem willing to open their mouths to take the hook.

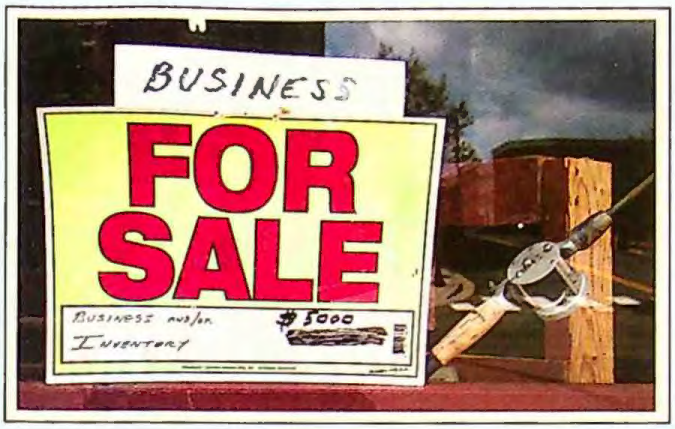
Oh well.

But, in truth, his totally understandable reticence on this matter makes me more fully appreciate why Phil and his long-serving Arlington rod and reel repair shop are considered pillars of Northern Virginia's vibrant fishing community.

Dr. Peter Brookes is a D.C. foreign policy nerd by day and an award-winning Virginia outdoor writer by night.

Phil Evans has kept a list of books he's planning to read in retirement.

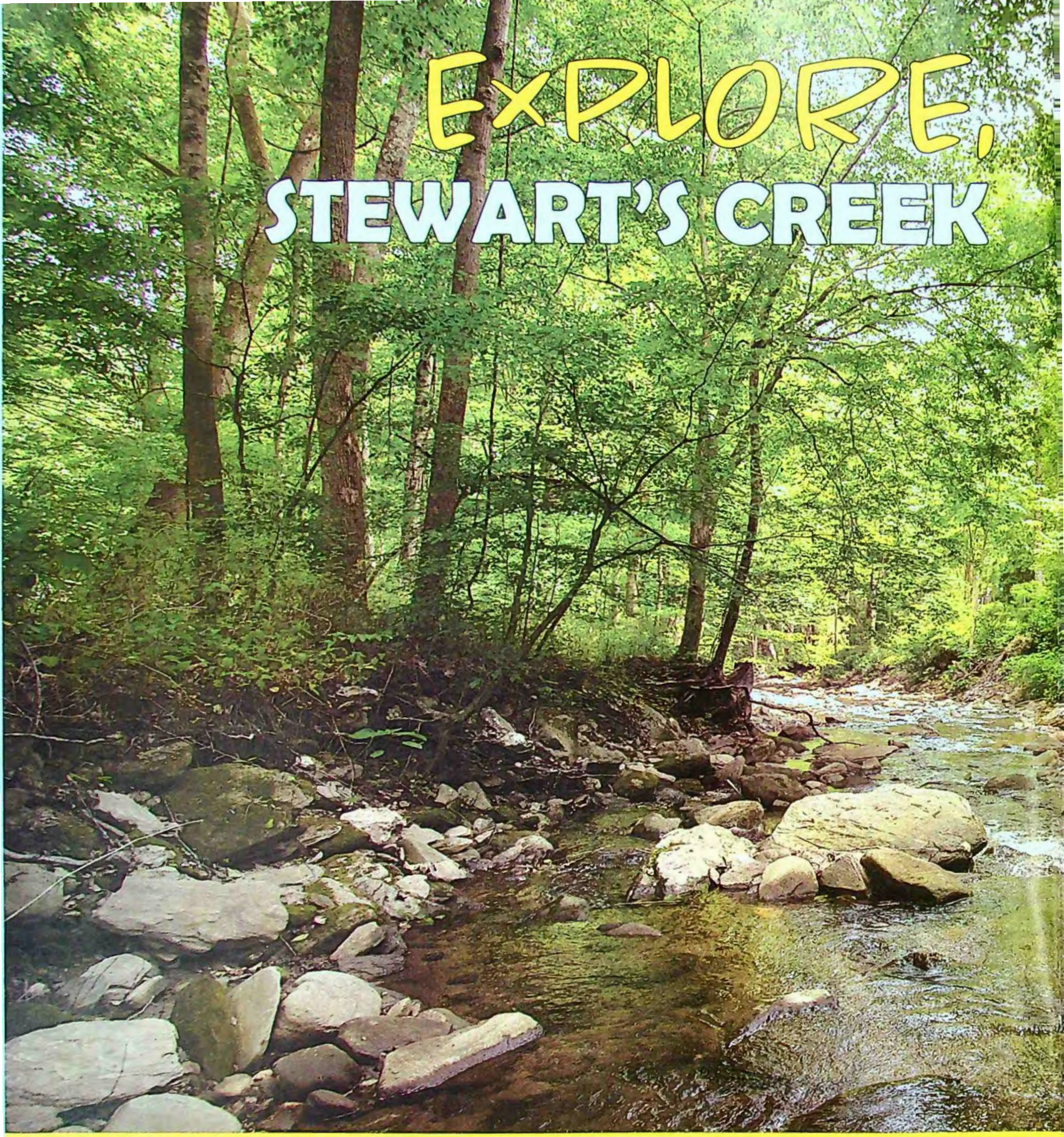
Hoping to sell his business before he retires, Phil will continue to "work long, but not that hard," as he likes to say.



NOT MANY PLACES LIKE THIS

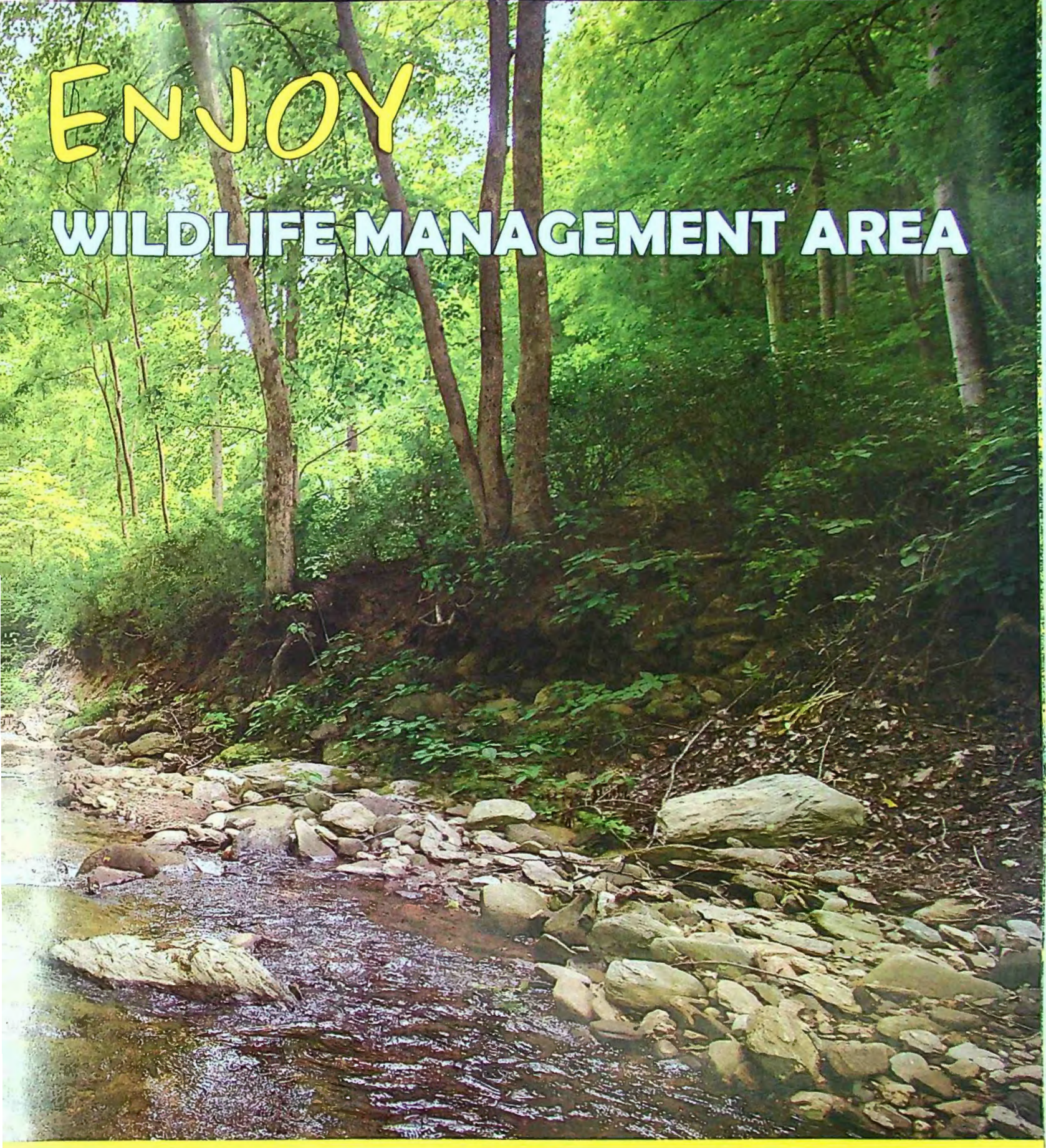
The reviews of Phil Evans' Rod & Reel Repair that appear online speak to the shop's unique charm and Phil's finesse.

- I have been passing this shop on my way to someplace else for 30+ years now. I was always curious but always thought to myself "some other day when I have more time." Well, today was that day. I brought in three vintage surf rods that I have been meaning to repair myself for at least 10 years. The proprietor is a soft-spoken, elderly gentleman with striking blue eyes who was re-varnishing some rods when I walked in. He looked my rods over, made note of what needed repairs, and wrote out a quote on a legal pad in pencil, and then totaled it up in his head. The prices, like the shop itself, seem like something from the 1960s. I agreed to the price, and told him I thought it was very reasonable. He asked for my name and I said Dave. He gave me an old fashioned tear-off ticket like you used to see at the dry cleaners. His name is Phil. Cash only. The rods will be done a week from Friday, but frankly I'm in no hurry. Rod and Reel Repair is an Arlington treasure that will be gone far too soon.
- Talking to Phil took me back in time to my childhood. It was like talking to my Grandad or one of his friends in one of their shops in small town America in the '70s. He is incredibly knowledgeable, talented and fair. His shop is a time capsule. Any person who fishes enough is bound to have a bad day every now and again and Phil can help you out. If you do have one of those days, go see Phil. Talk to him a bit. Stay awhile. I can't say enough good things about him. We're lucky to have him in this area.
- I am not sure how to describe this experience. I started out at DC Anglers, they are strictly fly fishing. I needed repairs on reels, one installed and spooled. I was referred to Rod & Reel Repair about two blocks away. I walked into a place time forgot. Phil Evans, the proprietor, was amazing. Man knows what he is talking about; he had parts to fix my reels from the '70s! One just needed some adjustments. I had a new freshwater reel I wanted spooled, he said he had a pole he would trade me for one of my old saltwater poles. Told him no immediately, sentimental value, it was my Dad's. He said, "He would tell you to get rid of it!" Told him he didn't know my Dad; he parted with nothing. Like Phil, he fixed and repaired rods and reels, but out of his garage. After all was said and done, he told me $15.00. Wanted to pay him for freshwater pole and he said no, it was a piece of junk! Gave him $20.00 and left very happy. He told me stories about fishing spots he had been to and how he enjoyed bluegill pan fried. He thanked me for stopping in and I was glad I did. Not too many places left like this and made me remember good times I had fishing with my Dad.

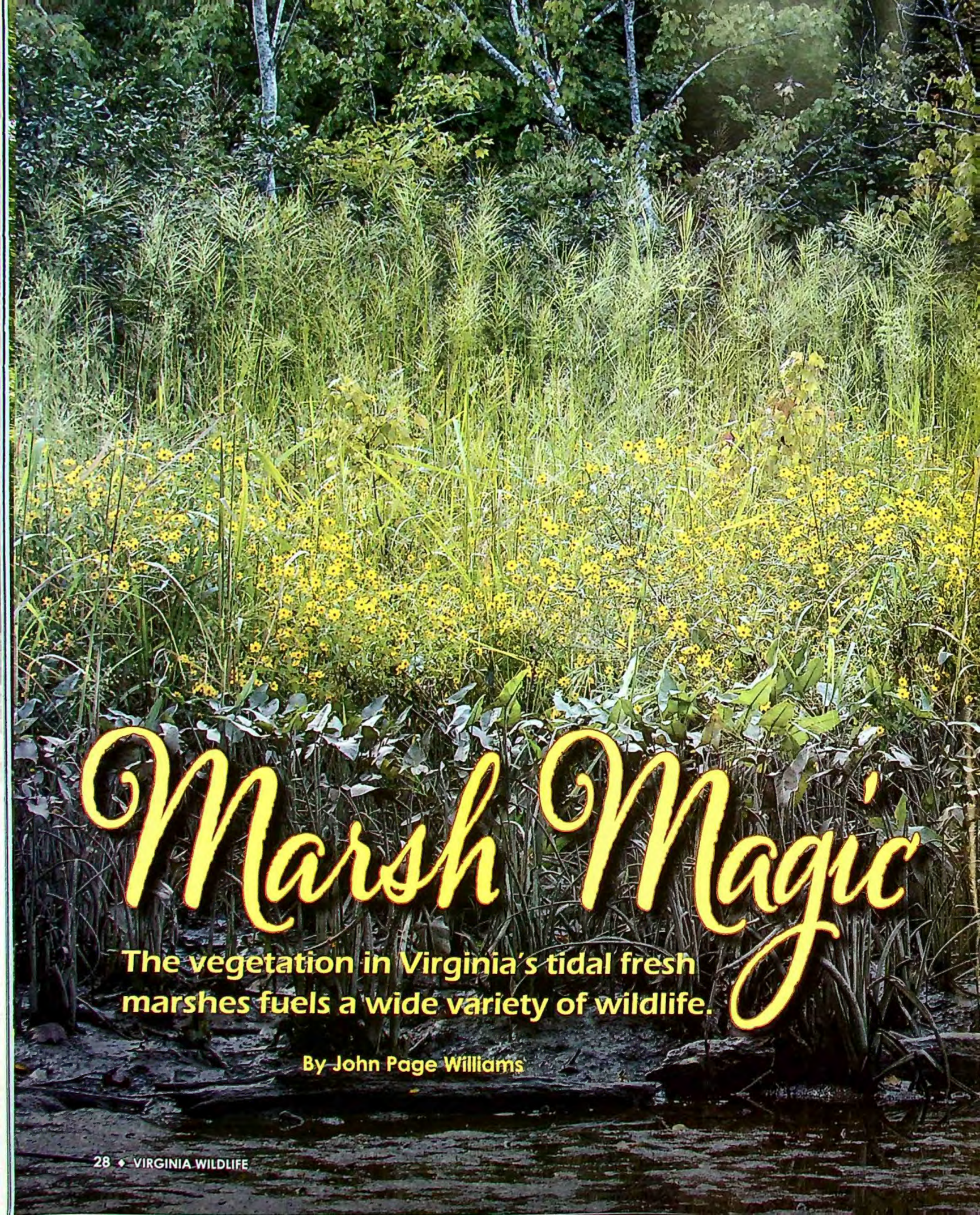


The Virginia Department of Wildlife Resources maintains 46 Wildlife Management Areas (WMAs) totaling more than 215,000 acres for a variety of outdoor recreational opportunities. To access a WMA, you'll need a DWR Restore the Wild membership or a Virginia hunting license, freshwater fishing license, boat registration, or access permit. For more information on WMAs: *www.virginiawildlife.gov/wma.*

Photo by Meghan Marchetti / DWR



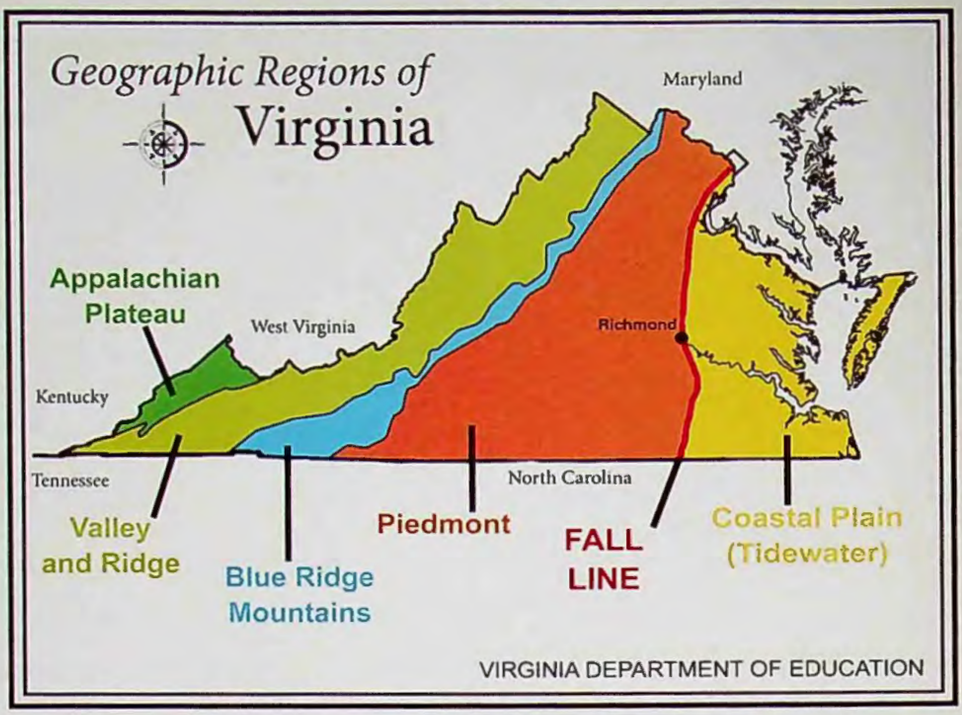
Located just off the Blue Ridge Parkway in Carroll County, Stewart's Creek WMA features native brook trout, clear mountain streams, rhododendron thickets, and scenic beauty on its 1,138 acres. Much of the terrain is rugged and steep, ranging in elevation from 1,580 feet to 2,955 feet. Deer, grouse, turkey, and squirrel hunting opportunities are available, while angling opportunities are highlighted by excellent native brook trout fishing. The WMA is also a site on the Blue Ridge Highlands Loop of the Virginia Bird and Wildlife Trail. Remnants of logging roads are available as trails, but not marked or maintained. Two small parking areas are available.



Marsh Magic

The vegetation in Virginia's tidal fresh marshes fuels a wide variety of wildlife.

By John Page Williams



When saltwater meets fresh in a tidal fresh river, what results is extraordinarily rich habitats for many species of wildlife, especially for furbearers like muskrats, river otters, and even bobcats, and for water birds from herons and their kin to migratory rails, ducks, geese, and tundra swans.

But wait. "Tidal fresh" is an oxymoron, isn't it? No, the term may sound strange, but consider the fall line, the point where a river's bed reaches the eastern edge of rolling Piedmont land. There, the bed's elevation drops below sea level as the river flows further east through the coastal plain, experiencing two tide cycles each day. That drop below sea level would allow salty ocean water to flow in, except for the fresh water flowing down from the river's watershed. That fresh water holds the salt at bay, so to speak, pushing it back toward the Chesapeake and the Atlantic.

How far the fresh water pushes the salt, and how the two begin to mix, depends on rainfall, river flow, tides, wind, and other physical factors. In the spring, a river can be tidal and fresh for 20 miles or more, while lower flow in the fall can allow the salt to creep up and shorten the fresh section.

Virginia is rich in big rivers that drain large watersheds, including two—the Potomac and the James—that run to the Chesapeake from all the way out on the Appalachian Plateau and the Shenandoah Valley. Another, the Rappahannock, draws off the eastern slopes of the Blue Ridge. Several—the Appomattox, Chickahominy, Pamunkey, and Mattaponi—carry extensive rainfall from the woodlands of the Piedmont, and the Piankatank taps the long, forested Dragon Swamp on the coastal plain between King and Queen and Essex, then Gloucester and Middlesex counties. Each of these rivers has plenty of flow to create substantial tidal fresh wetlands. Unlike salt marshes, where only a handful of plant species have developed structures to excrete excess salt, these fresh marshes are highly diverse, growing two dozen species or more.

Since the fall lines on these rivers constitute their heads of navigation, it's no surprise that Native American towns grew up on them, followed by colonial settlements that grew into cities, including Fredericksburg, Richmond, and Petersburg. The powerful flows carry the rivers' suspended sediments past those points, but flood tides begin to retard the rivers' flows and the basins widen

Shutterstock

Previous page: At low tide, this freshwater tidal marsh at Deep Bottom Park boat landing in Henrico reveals a row of pickerelweed growing from the muddy creek followed by bright yellow flowers called smooth beggarticks or butterweed, then tall, whispy wild rice backed by a wetlands forest. Photo by Lynda Richardson/DWR

out to slow them further. Thus, sediment begins to settle out along the banks, growing tidally flooded swamp forests of tree species like bald cypress, swamp tupelo, and sweetbay magnolia. Below grow shrub understories of buttonbush, swamp rose, silky dogwood, arrowwood, and winterberry.

Our subject here, though, lies a little further down, where the tides, the wider basins, and flat topography of sea level slow the flow even further, causing the rivers to meander back and forth in large, looping curves. As the flow rounds these curves, it accelerates on the outer edges, eroding soil from the banks, just as an athlete must run faster along an outside lane on a circular track to stay even with another on an inside lane. This process has been going on here for several hundred thousand years,

Bill Portlock/CBF

The Rappahannock River flowing to the Chesapeake Bay turns into an oxbow at the light-colored Fones Cliffs at the top right of the photo. Beverly Marsh, across the river, is home to numerous freshwater wetland plants such as wild rice, pickerelweed, arrow arum, and smartweeds, and is considered to be among the best black duck marshes in Virginia.

The James River near Jamestown has tidal freshwater marshes, as indicated by the communities of marsh plants growing along its marshes and banks.

through multiple glaciation cycles (ice ages) that dropped sea level more than 300 feet below today's height. As the last glaciation ended about 15,000 years ago, the Atlantic rose, backing up into the rivers' valleys until it reached its current range about 3,000 years ago.

The result of acceleration on the outsides of curves in Virginia's tidal rivers has been sections of eroded banks as high as 120 feet, such as the Rappahannock's Fones Cliffs and Horsehead Bluffs, right next to holes in the bottom scoured out by the fast currents that can drop to more than 50 feet deep. It's no accident that a lot of Native American towns and then colonial villages sprung up by the deep water on the outside curves in our waterways.

On the insides of the meanders, however, the currents slow down, allowing rich sediment to settle out. Since the last glaciation, Virginia's rivers have developed huge freshwater marshes in their meanders, some with their own meandering creek drainage systems. With salinity very low or nonexistent, diverse communities of marsh plants have developed on those rich sediments. Many are annuals or short-lived perennials that rely heavily or entirely on dropping large quantities of seeds or fruits to reproduce.

Those seeds have developed to start the next generations vigorously on their way, so they are packed with proteins and nutrients. Some with strong root systems store starch there. Over the millennia, both wildlife and humans have learned to forage these food sources, which become especially rich during September and October. No wonder these two months become great ones to Explore the Wild around these big marshes, whether by shore access or afloat. Check the Coastal Region of the Department of Wildlife Resources' (DWR) Virginia Bird and Wildlife Trail for more information.

But remember that all of those creatures are there because of what grows on the riverine soils of those marshes. Read on to learn about the plants that fuel them so lavishly.

Buckwheats: Smartweeds and Tearthumbs

Just as humans learned long ago the nutritional value of buckwheat flour, so have a wide range of birds learned to forage tidal fresh marshes for the seeds of this plants family. In the fall, check for tiny white seeds of dotted smartweed (*Persicaria punctata*) and slightly larger pink seeds of arrowleaf tearthumb (*Persicaria sagittatum*) and Halberd-leaf tearthumb (*Persicaria arifolia*). Though the plants are small, their seed production can build to several hundreds of pounds per acre of marsh.

The joke about smartweed is that eating a leaf will make you smart. It will indeed, but not your brain. The leaves contain oxalic acid, which will make your tongue smart. That's a joke I used to use on school field trips with students who always insisted that their teachers needed to try the plants. (Of course, the instructor had to be the first each day, so my tongue tingled for most of September and October in those days.) I never had a thumb torn by the other two plants, but their stems are seriously prickly, a good reason for us marsh explorers to wear long pants.

Lynda Richardson/DWR

Wild Rice

The six- to eight-feet-tall stalks of wild rice (*Zizania aquatica*) are evident in September and October, with rice grains "shattering" from their seed heads over a period of several weeks. It's no wonder that as they do, multiple species of blackbirds, bobolinks, sora rails, and blue-winged teal pile into Virginia's tidal fresh marshes. The Chickahominy, Pamunkey, and Mattaponi rivers grow particularly extensive stands of this prime wildlife plant, though there are solid pockets of it along the James and Rappahannock as well, especially up in their large tributary creeks.

Though it doesn't seem to matter to those birds or the larger waterfowl that follow, the grains of Virginia's wild rice are generally smaller than those of the semi-cultivated strains grown commercially in the marshes of the Upper Midwest. Native tribes certainly harvested them years ago, and some of us moderns try it, but the most satisfying experience is to look at the stands of it and enjoy the wildlife it attracts like a powerful magnet to our marshes.

©Gary P. Fleming

Rice Cutgrass

Rice cutgrass (*Leersia oryzoides*) provides another reason to wear long pants. Its long, slender leaves have tiny, stiff hairs on their edges that act like serrated teeth, though they make up for that trait by feeding the larvae of multiple butterfly and moth species. The plants produce copious seeds beloved of marsh birds, and they also develop strong rhizomes in the marsh soil as another strategy to spread their colonies.

Gary P. Fleming/DCR/NHP

Lynda Richardson/DWR

Walter's Millet

Walter's millet (*Echinochloa walteri*) is a tall, annual, barnyard grass whose heads of grain grow heavy at this time of year. Look closely at a few of the distinctive, fat, nutritious grains from a seedhead. Then look carefully on the surface of the water nearby. You'll see why dabbling ducks like mallards, wigeons, pintails, and black ducks hang out in these marshes in fall and winter.

Smooth Beggarticks (left)

Later in the year, smooth beggarticks (*Bidens laevis*) will cheerfully coat any human or dog that walks a Virginia tidal fresh marsh by latching on with the two little hooks projecting from one end of the seed. They'll also feed any seed-eating bird in the marsh over the winter. At this time of year, though, they flower profusely, carpeting the marshes where they grow with gold. On the upper tidal section of Maryland's Patuxent River, local people call them butterweed. Not a bad name for a beautiful, productive plant, wherever it grows.

The Broadleaves: Spatterdock, Arrow Arum, Pickerelweed, Arrowhead

All of these plants with large leaves and soft stems grow from rootstocks set deep in intertidal marsh soils. The plants are perennial, dying back to their thick root systems over the winter, then sprouting new growth next April and May.

The muckiest soils in deep outer margins of many Virginia tidal fresh marshes grow rims of spatterdock, also known as yellow pond lily (*Nuphar advena*). In summer, they provide valuable shade for fish like largemouth bass. By now, though, they are beginning to break down.

Shutterstock

Arrow Arum

Green arrow arum (*Peltandra virginica*) grows deep green, arrowhead-shaped leaves with several veins running along the margins of their leaves in addition to veins that radiate from the central stalk. They grow on the outer edges of marshes in slightly more brackish water than spatterdock. Arrow arum plants develop large, bulbous seed heads that rupture in early fall, spilling profuse quantities of green-and-black, grape-sized seeds that float in the marsh edges. Like smartweed leaves, these seeds contain oxalic acid that keeps most birds from feeding on them, excepting wood ducks that apparently like some heat in their diets.

Lynda Richardson/DWR

Pickerelweed

Pickerelweed (*Pontederia cordata*), whose leaves form rounded triangles, grows slightly shallower and on firmer sediments than spatterdock. In these two months, look for their deep blue/purple, finger-shaped flowers among thick stands.

Lynda Richardson/DWR

Arrowheads

Finally, arrowheads (*Sagittaria sp.*) come in several forms, mostly narrow or broad triangular shapes with long trailing edges. In these plants, the veins all radiate out from the central stem, unlike those of arrow arum. Unlike pickerelweed, arrowheads flower in the spring, but at this time of year, they are storing starch in their rootstocks. Some waterfowl grub in the mud to feed on those roots, and Virginia Native Americans regularly dug them up for food. Arrowheads grow only in fresh water, often at the upper reaches of tidal fresh creeks. Above: Broadleaf arrowhead or duck potato (*Sagittaria latifolia*).

In early September, tidal fresh marshes are still full of robust growth. As annual plants, though, when they finish dropping their seeds, they begin to die, and so do the soft upper parts of the broadleaves. By later October, many will have fallen to the surface of their marshes, and by Thanksgiving, their brown stubble will cover most of the marshes.

That dead plant tissue doesn't go to waste, though. Over late fall and winter, the weather and various microorganisms will decay it. Some will stay on the marsh to help build the soil for next year's plants, while more will form into a sort of vegetable stew on which tiny crustaceans will feed as next year's spring warms the water. They in turn will feed small forage fish like shiners, plus the fry and fingerlings of the shad, herring, and striped bass that come up our rivers then to spawn.

Get to know Virginia's tidal fresh marshes; they are dynamic engines for our big rivers.

In more than 40 years at the Chesapeake Bay Foundation, Virginia native John Page Williams championed the Bay's causes and educated countless people about its history and biology.

The Clinch River is the Crown Jewel of the First Blueway State Park

By D.J Mathews

Development of the Clinch River State Park will provide Virginians with an opportunity to enjoy even more of the most biologically diverse river in the northern hemisphere.

The Clinch River, named after an otherwise forgotten 18th century explorer, played a major role in the exploration and settlement of Southwest Virginia. Many early settlers made their homes along its eastern shore, while others crossed the formidable flow and explored the wilderness beyond its banks. Probably the most famous explorer to pace the banks of the Clinch and challenge its currents was Daniel Boone. Boone resided for some time near Castlewood, and negotiated the river during his many trips through Southwest Virginia.

The 250-million-year-old Clinch supports a unique assemblage of aquatic life. The river is home to about 50 species of freshwater mussels, which is more than any other river in the world, and more than 100 species of non-game fish—minnows and darters that sport brilliant colors and play a vital role in the survival of other fish and mussel species. The variety of sport fish is also what makes the Clinch a great destination for anglers. The Clinch cuts from Tazewell, Virginia through the Clinch Mountains and into Tennessee.

This history and biodiversity make Clinch River the perfect site for Virginia's first blueway state park, the Clinch River State Park. A blueway is a river trail or network of multi-activity recreational trails and sites closely linked with the water. Dedicated in June 2021, Clinch River State Park is still under development, but plans call for several smaller (250-400 acres) anchor properties connected by multiple canoe/kayak access points along a 100-mile stretch of the Clinch River.

Clinch River State Park Manager Scott Bowen explained that this park will be a river trail with multiple access points forming a "string of pearls" along the river's 135 state miles as it winds through Russell, Wise, and Scott counties.

> *"This park will be... a 'string of pearls' along the river's 135 state miles as it winds through Russell, Wise, and Scott counties."*

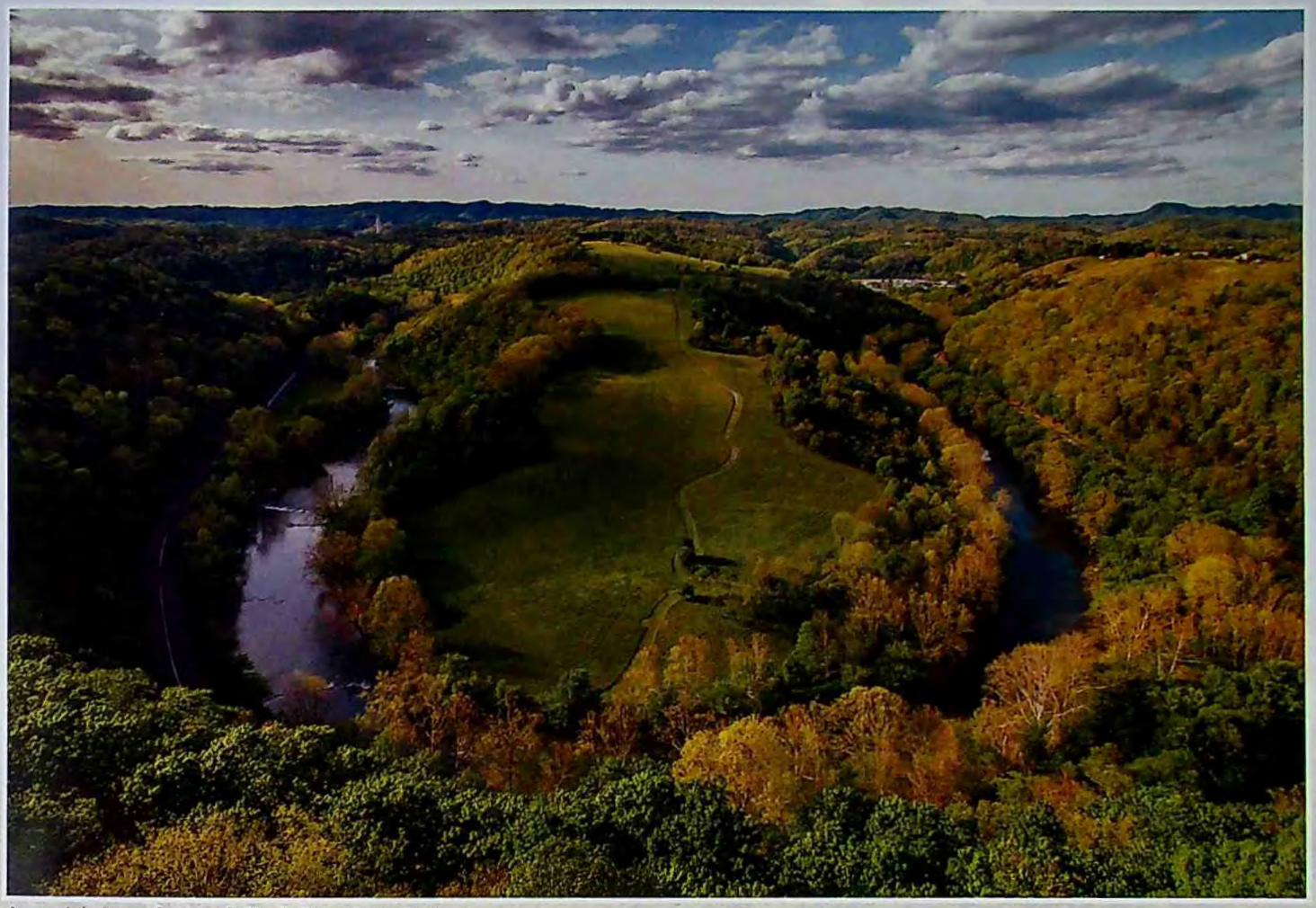
To work toward that goal, plans for the future of the park include three land anchor points that will provide access to the river.

©Issac Szabo

Tangerine darters are one of many species living in the Clinch River.

The first completed site is the Sugar Hill Unit, now open, which features 8 miles of trails for hiking, biking, fishing, and picnicking.

A boat landing at Artrip, near Cleveland in Russell County, currently serves as a boat launch site for visitors to the park. According to Department of Conservation and Recreation - Natural Heritage Program Regional Director Claiborne Woodall,



Courtesy of Virginia State Parks

An aerial view of part of Clinch River State Park.

the 234-acre Artrip property and another nearby parcel could be connected to the Cleveland Barrens Natural Area Preserve, on the town's west side. Cleveland Barrens has a waterfall and three-mile hiking loop amidst dolomite barrens. The barrens are also home to three rare insect species and rare plants like Indian grass and little bluestem, which provide a unique hiking experience to visitors.

As early as 2005, St. Paul conservationist and lawyer Frank Kilgore and a group of area citizens approached the Virginia Association for Parks, an advocacy organization, about developing another state park in far southwest Virginia. By September 2010, the Institute for Environmental Negotiation at the University of Virginia, in conjunction with area citizens, formed the Clinch River Valley Initiative (CRVI).

CRVI's primary goal was to develop Clinch River State Park. With the region's lifeblood, the coal industry, in decline, town officials, economic development experts, and environmental groups wanted to discover ways to address water quality, job development, and town revitalization through ecotourism. Developing a state park became one way to address many concerns, and area Virginia delegates like Terry Kilgore and Ben Chafin (now deceased) pushed to make a park a reality.

For visitors and sportsmen and women, the Clinch is "one of the top rivers in the country for biodiversity," said Brad Kreps, The Nature Conservancy Clinch Valley director. The river has more than 40 different freshwater mussel species. The bivalve mollusks can filter up to 20 liters of water a day. They, along with the elusive Eastern hellbender salamander, are big indications of water quality. Water quality is especially important to towns bordering the Clinch that have dealt with coal slurry or straight pipe pollution in the recent past.

Maddie Gordon, owner of Clinch Life Outfitters, a year-round specialty outdoor business in St. Paul, is a big fan of the Clinch. She's concerned about the effect of pollution on the river, specifically the damage to mussels.

In recent years she's been the Clinch River project manager for the StreamSweepers, a program based in Orange, Virginia. The program offers work experience for veterans and college-age people who want to help clear debris from waterways. Return workers will look at the river "impressed with the work that's been done," Gordon said. In the past three years alone they've removed more than 3,000 tires from the Clinch. In the warmer weather she also takes visitors on educational tours.

Interestingly, Virginia Department of Wildlife Resources (DWR) representatives have told her to leave some of the tires in the river for now. "The mussels love them," she said. DWR Freshwater Mussel Biologist Tim Lane, agreed, saying the tires do stabilize part of the river and provide a safe environment for the Clinch River's many mussel and fish species. But chemicals leaching from the tires aren't beneficial to the aquatic environment either, so the goal is to eventually remove them all.

©Stephen David Johnson

The Eastern hellbender, which can be found in the Clinch River, is a species that relies on cool, clean water.

> *"Twelve species of mussels found in the Clinch are listed as in danger of extinction because they are found in so few places."*

Lane, who is the coordinator for DWR's Aquatic Wildlife Conservation Center (AWCC) near the Buller Hatchery in Marion, pointed out that "the Clinch River has more endangered species than any river in the country." Twelve species of mussels found in the Clinch are listed as in danger of extinction because they are found in so few places. The AWCC has spent years discovering the 40-some fish species the mussels depend on as a host. Mussels' larval "glochidia" need to attach to a host fish's gills in order to obtain food and then drop off once they've reached a certain size.

While the river is the centerpiece of the area, there are many wildlife viewing opportunities on land as well. The St. Paul loop of the Virginia Bird and Wildlife Trial includes six sites of state and city lands likely to be productive for wildlife watching. Wetlands, montane, and woodland habitats can be found on this loop. Elevation ranges vary, with Sugar Hill Loop Trail climbing above

Meghan Marchetti/DWR

The Clinch River is an important site for the restoration of freshwater mussels, such as these that were propagated, tagged, and released by DWR's Aquatic Wildlife Conservation Center.

The Clinch River's remarkable biodiversity and beauty make it a unique resource for visitors.

and providing a stunning view of the Clinch River Valley. The Pinnacle towers above Big Cedar Creek and is surrounded by a fragile ecosystem. Several rare and endangered species reside here, including the magnificent but elusive hellbender.

The Clinch River area's ample opportunities for recreational activities, historical significance, and educational possibilities about mussel and fish species and water quality issues made it an ideal location for Virginia's first blueway state park.

A Master Naturalist member, D. J. Mathews of Radford has written the young adult book, "Great American Women in Science and Environment." You can see more of her work at www.writerdjmathews.com.

Woodland hiking trails can be found throughout the park.

Working for Wildlife By Ethan Hunt

The mission statement of the Department of Wildlife Resources (DWR) reads that we seek to conserve, connect, and protect: **Conserve** and manage wildlife populations and habitat for the benefit of present and future generations. **Connect** people to Virginia's outdoors through boating, education, fishing, hunting, trapping, wildlife viewing, and other wildlife-related activities. **Protect** people and property by promoting safe outdoor experiences and managing human-wildlife conflicts. Here are a few of the many accomplishments of DWR staff in working toward those goals…

Testing Skills in Hunter Education Challenge

DWR and the Virginia Hunter Education Association (VHEA) have hosted the Hunter Education Challenge for more than 30 years. Students under the age of 18 compete against each other in a wide range of skills: archery, outdoor skills, rifle and shotgun shooting, and a hunter responsibility exam. This year DWR held the statewide competition at Holiday Lake 4-H Educational Center in Appomattox. The archery event tested the competitors' shooting ability on a 3D archery course with life-sized animal targets. The outdoor skills event allowed competitors to prove their competence with a compass and also make ethical decisions, such as whether a shot at an animal is safe or not. The rifle event had shooters trying to knock down metal animal targets at different ranges, and the shotgun event consisted of a sporting clays course, which simulated flying game birds at many speeds and angles. Finally, the hunter responsibility exam highlighted hunter responsibility and animal identification.

Meghan Marchetti/DWR

Archers Shine at NASP State Tournament

Meghan Marchetti/DWR

DWR hosted the 14th Annual Virginia National Archery in the Schools Program (NASP) State Tournament at Meadow Event Park in Doswell. More than 950 archers from 32 schools competed in Bullseye and 3D Challenge events for scholarship prizes. Winning archers in the male and female categories were awarded educational scholarships of $5,000 for first place, $3,500 for second place, and $2,000 for third place. Some of the shoot-offs for top placings came down to a one-arrow shoot-off!

Liberty Christian Academy earned the Virginia Overall State Team Championship. All Virginia archers demonstrated positive sportsmanship, dedication to practicing, and commitment to archery. This event was possible due to the dedication of DWR's Complementary Work Force volunteers and DWR staff.

Jacob's Chance Visits to Learn

Lynda Richardson/DWR

Individuals from Jacob's Chance, a charitable organization that serves individuals 5 to 35 years old with developmental, intellectual and/or physical disabilities, joined DWR biologists and staff for three presentations in which they learned about a variety of animal-related subjects. Jacob's Chance provides differently abled people an opportunity to engage in inclusive programs that promote personal development and positive growth. The presentations from DWR covered ornithology (the study of birds), mammals, and herpetology (the study of reptiles and amphibians). Courtney Hallacher, DWR Wildlife Education Coordinator, said working with Jacob's Chance allowed her to get back to her teaching roots. "The students' enthusiasm to learn new information and share what they already knew allowed for a robust discussion in our time together," Hallacher said. "I was happy to be a part of this project!" The Virginia Wildlife Grant Program provided transportation for the events.

Flooding Waterfowl Impoundments

Throughout the year, Wildlife Area Managers (WAM) at some coastal Wildlife Management Areas (WMAs) maintain impoundments, or man-made ponds, to create habitat for waterfowl. "In the spring, we draw the water down to allow us to manipulate the vegetation, or to allow the native vegetation to grow," said Evan Shearer, WAM at Princess Anne WMA in southeastern Virginia. "We try to get the soil moisture to the right point for getting native vegetation to grow and plant vegetation that ducks want to eat. In the fall, we pump water into those impoundments to flood them for migratory shore birds and waterfowl." The impoundments are protected waters that create food sources and resting habitat for migrating waterfowl, benefitting both waterfowl hunters and wildlife watchers.

Evan Shearer/DWR

Elk Habitat Enhancement

Tom Hampton/DWR

DWR Board Member Leon Boyd hydroseeded reclaimed grassland habitats in the Elk Management Zone in Buchanan County. This area was previously covered by invasive shrubs such as autumn olive.

After clearing, the hydroseeding provides native vegetation for elk habitat and food sources. Southwest Virginia Sportsmen Inc., of which Boyd is president, has provided both funding and volunteer work hours that have been vital to enhancing wildlife habitats in this area for the past 10 years.

River Slapping, also Known as Fly Fishing

For this issue's Off the Leash, *enjoy re-visiting a classic Luke column from 10 years ago.*

It was half past nine. I had just crawled under the covers of my new four-poster bed when Ol' Jones came busting through the door wearing a pair of waders, an old stained fishing shirt, and a fly-fishing vest—complete with a landing net—reeking of sweaty sunscreen and mosquito repellent.

"Didn't you see the new sign on the door?" I inquired with a big yawn.

"You mean the one that says 'No Visitors After 8:59 p.m' ", asked Ol' Jones. "That's a good idea! I hate it when people don't have the good sense to know when it is too late to come calling and then don't know when it is time to leave." Without missing a breath, he added, "How do I look in my new waders?"

Now, one of the reasons why a dog is man's best friend is that a dog will not answer a question like that. Frankly, Ol' Jones' physique in a pair of waders looks more like an old inner tube that is about to blow. I said nothing, but did make a mental note to remove the "No Visitors" sign, as it had just proven its lack of value.

"I thought you had given up river slapping—I mean, fly fishing—after your last cold-water baptism on the Holston River," I reminded him.

"Well, that was before I went to the Fly Fishers of Virginia dinner and picked up a few valuable tips," replied Ol' Jones.

I will say one thing for Ol' Jones: he is consistent. He always picks up "valuable tips" after near drownings, shipwrecks, hot air balloon crashes, or race car driving mishaps.

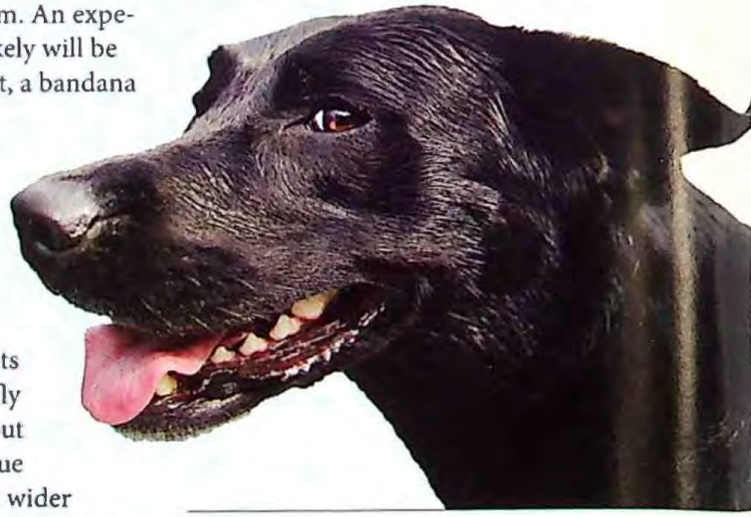
"First, as Billy Pearsall, former FFV president, told me, whenever you are going to a new stream or river, hire a guide—a guide who is experienced and knowledgeable about the water you are fishing will greatly reduce your learning curve. The guides have a better idea of where the fish are, but perhaps more important, they know where the hidden stumps, snags, or boulders are that could trip you up when wading through a stream. A fishing guide will make your day a great deal safer, and often a great deal drier.

"Another gentleman at the dinner, Andy Cox, told me to pay attention to what a fishing guide wears," continued Ol' Jones (obviously on an oratorical hot streak). "He pointed out that not only will you be catching fish, but you will be catching strong sun rays as well, and your skin's constant exposure over time could become a real problem. An experienced guide more than likely will be wearing a long-sleeved shirt, a bandana covering the neck, strong sun screen, and a hat. Of course, I already knew about the hat."

Now, Ol' Jones wears a wide-brim cowboy hat when fly fishing, not because he wants to look like some hot-shot fly fisherman from out West, but because his casting technique is herky-jerky at best, and a wider hat brim not only keeps the sun off his face, but also prevents impromptu ear piercings. Ol' Jones is so paranoid about body piercing a vital organ (any item that bleeds is considered vital by him) that when he fly fishes for tarpon down in Florida, he wears a football helmet. That may sound a little odd, but it only takes one of those big-hooked, heavy lures bouncing off the back of your head to make you think very carefully about personal safety. Consider also how embarrassing it may be having a punctured earlobe whistle like a tea kettle when a slight breeze kicks up.

If fly fishing is on your list of things to do, check out DWR's online Trout Fishing Guide at *virginiawildlife.gov/fishing/trout/*, check out the monthly Fishing Reports on DWR's YouTube page, and subscribe to DWR's monthly Fishing Notes from the Field email newsletter (*virginiawildlife.gov/the-outdoor-report/*).

Keep a leg up,
Luke



Luke spent many sunrises hunting up good stories with Clarke C. Jones, and thankfully, left us a cache of colorful tales. You can learn more about Clarke and Luke at clarkecjones.com

A Walk in the Woods

Column and photo
by Mike Roberts

Quoth the Raven "Nevermore"

Through all my years of walking through the woods, I have been extremely fortunate to observe several instances of animal behavior considered abnormal or unusual, as was a case of a female belted kingfisher raiding a nest of Northern rough-winged swallows.

One unusual observation occurred in Shenandoah National Park in October during the early 1990s. Broken down in seasonal semesters, Shenandoah was my white-tailed deer classroom. Because hunting was not permitted within the park's boundaries, deer numbers were high and the otherwise wary creatures went about their daily routines without human interference. Acclimated to park visitors, the whitetails provided the perfect opportunity for photography and gaining firsthand behavioral knowledge.

Perhaps my favorite location to photograph Shenandoah's whitetails was an area on the east side of Skyline Drive, between Elkwallow and Matthews Arm. There, an abandoned orchard was living proof of a family of settlers that once survived a tough lifestyle farming the thin, rocky soil. Sixty years after their controversial, forced departure, the only tangible proof of these mountain people's existence was a number of apple trees scattered about in the naturally reclaimed forestland. The trees still produced a bounty of sweet fruit that attracted wildlife, especially black bears and deer.

On that crisp, autumn morning, I had hiked to the orchard in anticipation of photographing bucks leaving the security of the adjacent laurel thickets to scent-check doe deer attracted to the fallen apples. While keeping an eye out for potential subjects moving through the underbrush, something caught my attention from a limb high in one of the fruit trees. To my surprise, it was a raven hopping from limb to limb. Knowing they were opportunistic feeders, watching the bird pluck an apple was no surprise, but what it did afterward caught me somewhat off guard. Rather than flying away with the apple lodged in its bill, the raven departed with it clutched, raptor-like, in the grasp of its left foot. A while later the bird returned only to repeat the action; and as if that was not bizarre enough, a second raven appeared and performed the same feat. Question remains, was the ravens' behavior a fluke or was it evidence of our largest passerine's physical ability to accomplish feats impossible for smaller perching birds?

Regarding avian intelligence, once while photographing predators feeding on an elk carcass in Yellowstone National Park, I observed *Corvus corax's* uncanny ability to outwit its competitive neighbors. While a huge, male grizzly napped in the blood-stained snow, a courageous coyote cautiously approached the rib cage, quickly grabbed a tidbit of meat, and trotted a hundred yards or more down the hill where he pawed out a hole and buried the morsel. No sooner than the fluffy canine had returned to the elk remains, a raven flew to the cache, recovered the scrap, and flew away with the piece of food secured in its long, heavy beak. This activity was duplicated a half-dozen times or more until the bear woke up and chased the coyote from the kill site.

Ravens are opportunistic omnivores, consuming carrion, berries, small rodents, baby birds, bird eggs, arthropods, reptiles, amphibians, and even human refuse. Because they lack raptorial bills to rip through the tough hides of dead mammals, ornithologists believe sharp-eyed ravens call loudly to attract raptors and canids to carcasses. After the larger predators and scavengers have torn through the hide and eaten their fill of flesh, the cagey birds fly in to pick the bones clean.

Thanks to American literature focused on the dark side of life, many view the common raven as an omen of death. To those of us who love the great outdoors, however, few sounds symbolize wild places more than the coarse, croaking calls of one of the world's cleverest birds and Poe's prophet!

A lifelong naturalist and wildlife photographer, Mike Roberts enjoys sharing his knowledge with others. You can contact him at: return2nature@aol.com.

PHOTO TIPS

Column and photos
by Lynda Richardson

Things That Don't Belong

One thing that will make you a more successful nature photographer is the ability to spot "things that don't belong." These are wildlife subjects that the average person would walk right by. If you use this principle as you wander in search of subjects you may discover amazing photographic opportunities that would otherwise go unnoticed.

Near my home is a riverside park where I love to take my dogs for walks. While they are sniffing, squatting, and lifting their legs, I look around. Sometimes an out-of-place spot of white will catch my eye, and I'll discover a white-tailed doe watching from several yards away, unbeknownst to my busy dogs. Another time it might be a dark shape on top of a leaf which, upon further inspection, turns out to be a green tree frog.

On a recent trip to Tangier Island, a small island in the middle of the Chesapeake Bay, I found the perfect example of "things that don't belong." On Tangier, you can only walk, bike, or ride a golf cart to get around. I always prefer walking as I can more carefully observe my surroundings.

Walking around the island, I saw wading birds as they hunted the freshwater marshes in the interior of the island. I saw muskrat swimming in a waterway and otter tracks near the beach. Curious if any reptiles or amphibians lived on the island, I was told that black and garter snakes were common and rarely, a rough green snake could be found.

I made my way to the island's airstrip, where blackberry brambles grew wild along its eastern edge. I figured this would be a great location to find song birds and insects. As I slowly walked, scouring the tangled mess, I saw something that seemed out of place. Standing out against a dark, shadowed background appeared a curved, lime-green vine seemingly suspended in mid-air.

It took me a second, but I'm not kidding when I say that the first words out of my mouth were a loud, "No way!" I stood there staring, not sure that I was really seeing what I thought I was seeing.

I had spotted a rough green snake.

Carefully, maneuvering my way into the fortress of thorns and poison ivy, I worked to get closer to the snake. As I slowly advanced, the snake began doing something I call wind camouflage, where it sways like the branches around it as the wind blows. Another step closer and I stumbled, causing the snake to turn and face me. I'm not sure if this was a strategy to appear less obvious to a potential predator or that if it just wanted me to know I was spotted. Needless to say, it didn't have to worry because now I was locked in place.

With a Canon EOS 7D Mark II camera and a 100-400mm f/4.5-5.6 lens I started shooting. Not being able to move or change angles was frustrating, but the graceful snake allowed me about 15 minutes before it went on its way. I did get to capture a couple of photographs, but in this case it was more about discovering the snake than photographing it. Cultivating the skill to see "things that don't belong" will help you become a more successful photographer. It is forever my mantra and should be yours as well! Good luck!

Lynda Richardson is the art director of this magazine.

WADE TRUONG

Wrapping trout, or any lean protein, in bacon is about as popular as putting butter on your potatoes. Bacon adds fat and smoky flavor—it basically makes everything taste like bacon, which isn't a problem if you want everything to taste overpoweringly like bacon. But if you want to taste the subtle flavors of a delicate protein like trout, and still want the addition of salty and crispy pork, a different porcine product is the answer.

When I want to wrap trout with pork, I prefer to wrap it in dry-cured ham instead of bacon. Hams such as prosciutto, serrano, iberico, or Virginia country ham have lower fat contents and generally lack smoky notes. If you want the smoky flavors, speck is a dry-cured ham that has been lightly smoked. Shaved thin, these hams add a crispy, salty richness that contrasts well with mild flakiness of trout. And because these hams are cured and ready to eat, they do not require cooking to any specific internal temperature. This means that as soon as the trout is done, the dish is done. No waiting for the bacon to finish rendering and get crispy, which usually leads to overcooked trout.

For this recipe I used some venison prosciutto that I made. Texturally, it's almost identical to pork prosciutto, but is a little leaner. Regardless of the ham you use, make sure it is sliced thin. You want to nearly be able to see through it. The thinner it is, the crispier it will get, and the easier it will break up as you serve the trout. Thick-cut ham, or bacon, will require some knife work to portion up the trout, which will inevitably smash the trout fillet to bits.

For additional flavor, I stuff the trout with lemon slices and fresh oregano, but you could use any seasoning or herbs you like. Make sure you season the inside of the trout as well as the skin side. You can make this dish in the oven or grill in less than 15 minutes.

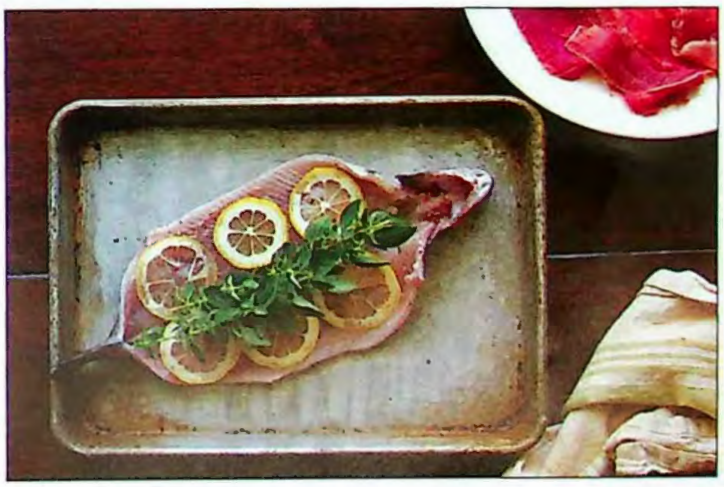
Prosciutto-Wrapped Trout

1 whole trout, butterflied
½ lemon, sliced into thin rounds
2 sprigs fresh oregano
2-4 ounces prosciutto, sliced thin

Preheat the oven or grill to 350-375°F.

Season the inside and outside of the trout with salt and pepper. Stuff with lemon and oregano.

Fold the trout closed. Wrap with ham, overlapping ends slightly. Lightly oil trout and place on lightly oiled pan. Cook in oven or grill for 10-12 minutes until the internal temperature reaches ~130°F. Serve immediately.



Wade Truong is a lifelong Virginian and self-taught chef and hunter whose work has been featured in The New York Times *and* Garden & Gun. *To learn more about Wade and his company, Elevated Wild, check out: elevatedwild.com*

GOOD READS

BY COURTNEY HALLACHER

Let's Go Fishing

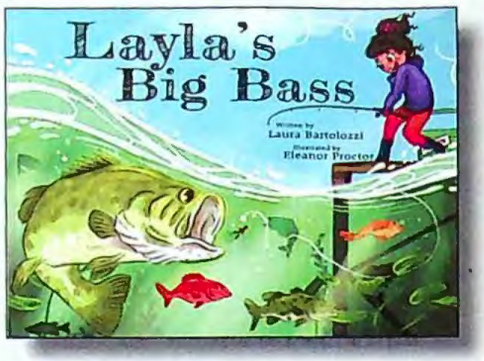
By Joshua Mutters, color illustrations by Gabby Correia
2021, independently published
joshuamutters.com/home

If you have a young, aspiring freshwater angler between 2-8 years-old, on your hands, then this is the book, by a Virginia author, for you! Through colorful and diverse illustrations, *Let's Go Fishing* will inspire you and your child to get outside and drop a line in the water. Step by step, this book introduces you to 25 freshwater fish, many that you can find right here in Virginia, and what it takes to catch them. Whether you are fishing for trout or bass, catfish or sunfish, as the book says, all "you need are a rod and reel… some patience and skill." New to fishing and don't have the gear? Check out DWR's Tackle Loaner Program on our website: virginiawildlife.gov/education/fishing/ and remember that children under 16 do not need a fishing license.

Layla's Big Bass

By Laura Bartolozzi, color illustrations by Eleanor Proctor
2021, independently published
laurabartolozzi.com/

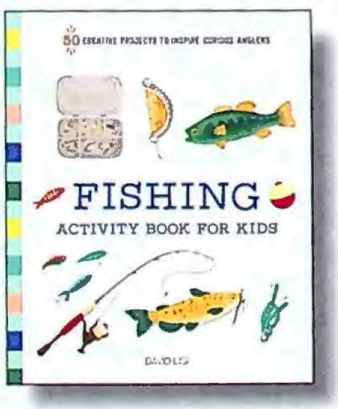
For the slightly more experienced young angler aged under 8, journey with Layla as she attempts to land the biggest bass in the lake. Will she use a jig or swimbait, her baitcaster or spinner, to come out the winner? Read *Layla's Big Bass* to find out, then grab your rods and create your own journey as you complete the Virginia Bass Slam Challenge. The Bass Slam challenge adds adventure to your child's next fishing trip as you explore new resources in an attempt to catch three types of bass (largemouth bass, smallmouth bass, and striped/hybrid bass) in one year. For more information about the challenge visit *virginiawildlife.gov/fishing/virginia-bass-slam-challenge/*.



Fishing Activity Book for Kids: 50 Creative Projects to Inspire Curious Anglers

By David Lisi
2021, Rockridge Press

Learning more about fishing tackle, techniques, and how to find the best fishing spots can elevate your young angler's ability and fishing confidence. Written for ages 8-12, the *Fishing Activity Book for Kids: 50 Creative Projects to Inspire Curious Anglers* gives young anglers ownership and a level of independence over their fishing experiences. Readers first learn how to select their preferred fishing line, tie knots, set up their rig, and create their own tackle box. Next your angler will learn how water temperature, clarity, currents, and even the moon can affect fish behavior so they can pick the best spots and times for fishing. Anglers will then learn how to safely handle fish and remove hooks—included is even a way to practice this at home!



Lastly, they will learn about the basic biology of freshwater fish through a series of easy-to-do at-home experiments. The book also includes lots of do-it-yourself activities, from creating your own fishing pole and lures to making a barometric fishing meter to monitoring the air pressure in the atmosphere, which can affect fish behavior. This book provides almost everything you need to know to turn your curious angler into a lifetime one. The only thing this book can't provide is that feeling of reeling in a fish, so grab your rods and get outside.

As DWR's Statewide Wildlife Education and Project WILD Coordinator, Courtney Hallacher works to bring wildlife and outdoor education into classrooms and households across the state through various Project WILD teacher trainings and DWR's social media platforms. During 17 years as a public school educator, Hallacher taught biological sciences at the high school level and life science to seventh grade students. She also worked as a teaching partner and adjunct professor at Mary Baldwin University and as an outdoor environmental educator for Blue Ridge Community College's Learning Can Be Fun summer camps.

UPCOMING EVENTS

September 23-25
Virginia Hunter Skills Weekend
holidaylake4h.com/virginia-hunter-skills-weekend.html

September 24
National Hunting and Fishing Day
nhfday.org/

September 24 & 25
Youth & Apprentice Deer Hunting Weekend

October 8
World Migratory Bird Day
migratorybirdday.org/

October 8 & 9
Youth & Apprentice Bear Hunting Weekend

October 8 & 9
Youth & Apprentice Fall Turkey Hunting Weekend

October 22
Youth & Veterans Waterfowl Hunting Day

October 24-31
Bat Week
batweek.org

2023 *Virginia Wildlife* Photography Showcase issue

Submissions are now being accepted online!
virginiawildlife.gov/virginia-wildlife/photo-showcase-entry/

DEADLINE: Monday, February 6, 2023

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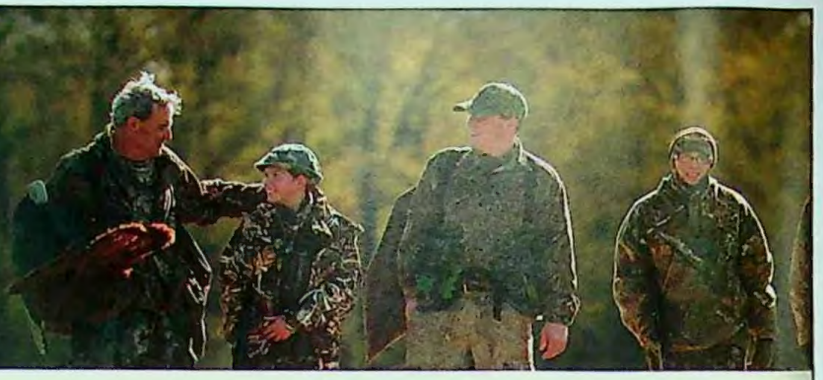

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PICS FROM THE FIELD

While visiting their son at Virginia Tech, Katie and Scott Beverley of Glen Allen stayed at a farm right outside of Blacksburg. The farm offered bird hunting, and their 10-month-old Boykin spaniel, Filson, flushed and proudly retrieved a nice quail. Needless to say his "parents" were also proud. This moment was captured with an Apple iPhone 11 Pro, ISO 20, 1/800, f/2.0. Katie, thank you for sharing!

You are invited to submit up to three of your best photographs for possible publication in Pics from the Field. Please include contact information (email and phone number, city or county you live in) and send only high-resolution (minimum size, 4"x6" at 300ppi) jpeg, tiff, or raw files via email attachment or WeTransfer to: Lynda.richardson@dwr.virginia.gov. We look forward to seeing your best work!

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2023 CALENDAR

JANUARY
RED FOX

FEBRUARY
NORTHERN CARDINAL

MARCH
SPOTTED SALAMANDER

APRIL
WILD TURKEY

MAY
CRESCENT SHINER

JUNE
RED-COCKADED WOODPECKER

JULY
ROSE-BREASTED GROSBEAK

AUGUST
WOOD TURTLE

SEPTEMBER
EASTERN CHIPMUNK

OCTOBER
WHITE-TAILED DEER

NOVEMBER
MUSKELLUNGE

DECEMBER
TUNDRA SWAN

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